U.S. Department of the Interior
U.S. Geological Survey

MINERALS YEARBOOK

Area Reports: International 1997

Europe and Central Eurasia

Volume III

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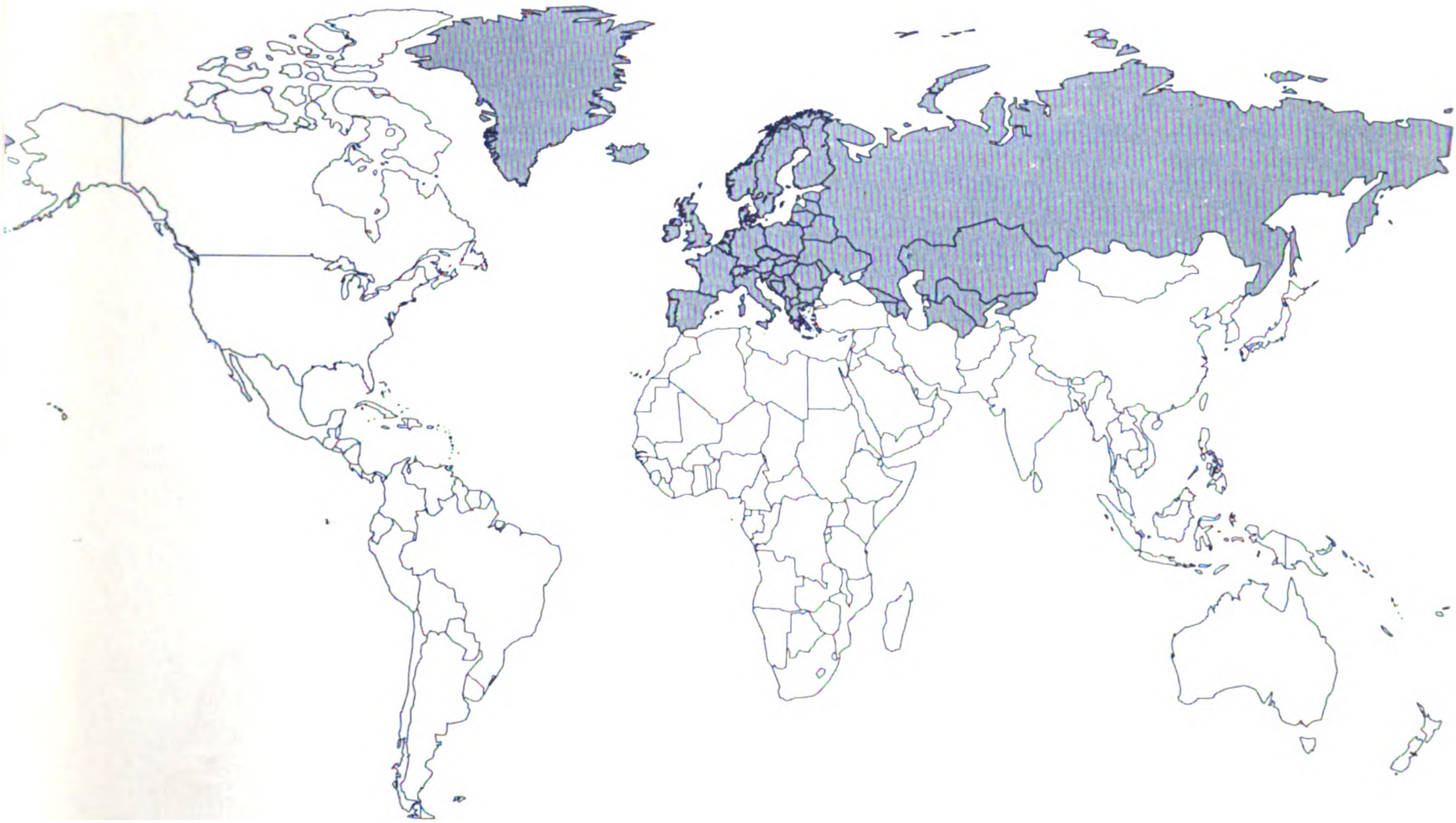

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U.S. Geological Survey

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Europe and Central Eurasia

Volume III

U.S. Department of the Interior
Gale Norton, Secretary

U.S. Geological Survey
Charles G. Groat, Director

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Foreword

This edition of the U.S. Geological Survey (USGS) Minerals Yearbook discusses the performance of the worldwide minerals and materials industries during 1997 and provides background information to assist in interpreting that performance. Content of the individual Minerals Yearbook volumes follows:

- Volume I, Metals and Minerals, contains chapters about virtually all metallic and industrial mineral commodities important to the U.S. economy. Chapters on survey methods, summary statistics for domestic nonfuel minerals, and trends in mining and quarrying in the metals and industrial minerals industries in the United States are also included.
- Volume II, Area Reports: Domestic, contains a chapter on the minerals industry of each of the 50 States and Puerto Rico and the Administered Islands. This volume also has chapters on survey methods and summary statistics for domestic nonfuel minerals.
- Volume III, Area Reports: International, is published as four separate reports. These regional reports contain the latest available minerals data on more than 190 foreign countries and discuss the importance of minerals to the economies of these nations and the United States. Each report begins with an overview of the region's mineral industries during the year. It continues with individual country chapters that examine the mining, refining, processing, and use of minerals in each country of the region and how each country's mineral industry relates to U.S. industry. Most chapters include production tables and industry structure tables, information about Government policies and programs that affect the country's minerals industry, and an outlook section.

The USGS continually strives to improve the value of its publications to users. Constructive comments and suggestions by readers of the Minerals Yearbook are welcomed.

Charles G. Groat, Director

Contacts

Information about the U.S. Geological Survey, its programs, staff, and products may be accessed on the World Wide Web at URL http://www.usgs.gov/ by contacting the Earth Science Information Center at 1-888-ASK-USGS. For specific information about this publication, contact the Chief, International Minerals Section, Minerals Information Team, at (703) 648-7732 or the Chief, Publication Services Section, Minerals Information Team at (703) 648-4750. Additional minerals information may be accessed on the World Wide Web at http://minerals.usgs.gov/minerals/.

Acknowledgments

The Country Specialists in the Minerals Information Team, U.S. Geological Survey, in preparing the International Review regional books of Volume III of the Minerals Yearbook, extensively use statistics and data on mineral production, consumption, and trade provided by various foreign Government minerals and statistical agencies through various official publications. The cooperation and assistance of these organizations are gratefully acknowledged. Statistical and informational material was also obtained from reports of the U.S. Department of State, United Nations publications, and the domestic and foreign technical and trade press. Of particular assistance were reports submitted by the Resource Reporting Officers and other officers of the Department of State in U.S. Embassies worldwide. Their contributions are sincerely appreciated. Internal statistical support was provided by the staff of the Data Collection and Coordination Section of the Minerals Information Team.

The regimes of some countries reviewed in this volume may not be recognized by the U.S. Government. The information contained herein is technical and statistical in nature and is not to be construed as conflicting with or being contradictory of U.S. foreign policy.

John H. DeYoung, Jr.
Chief Scientist, Minerals Information Team

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THE MINERAL INDUSTRIES OF

EUROPE AND CENTRAL EURASIA

By Richard M. Levine, Harold R. Newman, and Walter G. Steblez

Introduction

The dynamic social, political, and economic transformations in Europe and Central Eurasia that have been characteristic of this region since the late 1980's had acquired an ongoing evolutionary character by 1997. In Western Europe, the European Union (EU) developed into a major economic organization. Having gained momentum, economic integration led to the creation of a single currency union, encompassing most of the EU members. Central and Eastern Europe and Central Eurasia continued the difficult process of trying to create market economy systems and democratic political institutions.

An economic asymmetry, however, continued between Western Europe and the former centrally planned economy countries of Central and Eastern Europe, and Central Eurasia. In the minerals sphere, the interaction between the countries Western Europe and those of Central and Eastern Europe, and Central Eurasia was based on this asymmetry. Western Europe imported mineral commodities from, toll-smelted raw materials in, sold equipment and technology to, and invested in the mineral enterprises and mineral development projects in those former centrally planned economy countries, largely without reciprocal activities on the part of the latter.

Table 1 lists the mineral production for selected metals, industrial minerals, and mineral fuels by the countries in the three subregions (Western Europe, Central and Eastern Europe, and Central Eurasia) for 1997. By contrast, the previous summary table (published in the Minerals Yearbook, v. III, for Europe and Central Eurasia for 1993) displayed fewer industrial minerals and no mineral fuels. The 1997 table includes secondary aluminum, the new members to the EU, and the collateral diminution of the European Free Trade Organization.

Western Europe

In 1997, Western Europe remained a major world minerals processing and consuming subregion and, consequently, a major determinant of world demand for all mineral commodities. The subregion continued to account for a significant share of world production of such ferrous and nonferrous metals as refined zinc (27%), refined lead (26%), crude steel (20%), pig iron (17%), primary aluminum (14%), refined copper (14%), and alumina (11%). Mine output of such commodities as bauxite, copper ore, and iron ore, played a smaller role in world production in 1997, and that of chromite, lead, and zinc was somewhat greater, amounting to more than 4%, about 6%, and 9%, respectively, of world production.

Germany was Western Europe's dominant producer of steel, accounting for about 30% of subregion's steel output, and primary and secondary aluminum, collectively accounting for about 19% of total primary and secondary production by the subregion. With respect to primary aluminum alone, Norway was the major Western European producer, accounting for about 30% of the subregion's total production. In addition to Germany, the subregion's major smelters, refiners, and fabricators of metals were France, Italy, Spain, and the United Kingdom.

Mineral resource development in the subregion has been encouraged by revised mining legislation, deregulation, and tax relief. Important events in the metals mining sector included the startup of major gold mining operations in Spain and in Italy (on Sardinia) and the development of two gold mines in Scotland. Lead and zinc mines were being developed in Ireland.

With respect to industrial minerals, Western Europe played an important role as a world producer of such commodities as salt (22%), potash (21%), cement (12%), nitrogen (10%), and sulfur (10%), of which Germany, as the dominant Western European producer, accounted for about 36%, 65%, 21%, 25%, and 22%, respectively, of the subregion's total production of these commodities.

Western Europe's production of coal, natural gas, and petroleum amounted to about 8%, 13%, and 8%, respectively, of total world production. Germany was the leading producer of coal, accounting for 61% of total Western European output. The United Kingdom, the Netherlands, and Norway were the subregion's largest producers of natural gas in 1997, with output measuring about 30%, 29%, and 23%, respectively, of total gas production. Norway and the United Kingdom also were Western Europe's largest producers of crude petroleum, accounting for 50% and 41%, respectively, of total petroleum output.

The main trend in mineral exploration in Western Europe was for such metals as copper, gold, lead, and zinc. Exploration for copper was mainly in France and in the Iberian Pyrite Belt of Portugal and Spain, and that for lead and zinc was conducted mainly in Ireland. Gold exploration was ongoing in several areas of Western Europe where continuing discoveries of gold mineralization have encouraged further exploration efforts. In addition, exploration for diamonds was conducted in Scandinavia.

Central and Eastern Europe

In 1997, Central and Eastern Europe, with the exception of Poland, remained a modest producer of mineral commodities. As indicated in table 1, the subregion's production of selected mineral commodities, as a percentage of world production, seldom exceeded 5%. Poland, however, was among the leading world producers of such mineral commodities as coal, copper, salt, and sulfur and a main regional producer of such commodities as lead, steel, and zinc. The country ranked as the world's eighth largest producer of copper, accounting for about 4% of the world's output of copper in ore and 3.3% of the world's output of copper metal. It accounted for about 3.3% and 3% of the world's mine output of lead and zinc, respectively, and also was the world's seventh largest producer of silver. Among world producers of industrial minerals, it was ranked ninth in the output of salt and seventh in the output of sulfur, accounting for about 2% and 4%, respectively, of total world production. Poland's output of coal was substantial, amounting to more than 4% of world production.

In Central and Eastern Europe, the transformation to market economic systems and democratic political institutions continued. Major progress by the Czech Republic, Hungary, and Poland toward accedence to standards leading to EU and North Atlantic Treaty Organization membership was evident. The subregion, however, continued to evolve unevenly owing to the remaining political and military crises in the Balkan areas, as well as to the generally slower pace of economic and political reforms in the Balkans than in Central Europe. Consequently, foreign investment was more evident in the Central European area where, for example, EU-based commercial entities had invested heavily in more than 90% of the cement industries in the Czech Republic, Hungary, and Poland with their associated raw materials quarries. Important exploration work for gold by EU and other Western investors was underway during the year in the Czech Republic and Hungary.

Central Eurasia

In 1997, the countries of the former Soviet Union (FSU) appeared to be on a path to creating market economies, which had generated renewed faith in foreign investors, as evidenced by the doubling of share prices on Russia's equity market during the first half of the year. In the minerals sector, many enterprises also appeared to be making this market-oriented transition. Following the collapse of the Soviet Union, foreign investment interest in mineral producing enterprises other than gold and oil was slight. More recently, investors have begun to show interest in other mineral commodities if the deposits or production facilities are of sufficient quality. Although a trend of privatizing mineral industries and passing control some of the more productive enterprises to a new group of foreign and domestic investors was emerging, the fate of the majority of mineral enterprises, which were below the threshold of investor interest in terms of quality, remained uncertain. Some appeared to be trying to create new market niches through creative efforts, including mergers and changed production profiles, but many others appeared to lack a necessary base for survival. A major factor impeding the revival of many mineral production enterprises within the FSU was the dramatically lower level of mineral consumption in this region that followed the breakup of the Soviet Union.

Despite the decline in the FSU's production and consumption of mineral commodities, the scope and scale of this subregion's mineral output is evident in table 1. The FSU continued to be a major world producer of minerals, with significant world output of such nonferrous metals as primary aluminum (14%), alumina (10%), mine and refined copper (8% each), mine and refined zinc (6% and 5%), bauxite (5%), and mine and refined lead (2% and 3%). With respect to ferrous metals, the FSU had a significant share of the world output of plant production of nickel (23%), iron ore (18%), chromite (15%), manganese ore (15%), pig iron (10%), and crude steel (10%). The subregion also produced a significant share of the total world production of such selected industrial minerals and fuels as natural gas (29%), potash (26%), nitrogen (13%), petroleum (10%), sulfur (10%), coal (7%), phosphate (7%), cement (3%), and salt (2%).

Although Kazakhstan, Ukraine, and Uzbekistan were important world producers of a number of mineral commodities, Russia, with 75% of the territory of the FSU, remained a major world producer of a broad range of mineral commodities. Russia's status as a world minerals producer in 1997 may be summarized as follows:

Aluminum	2d	Natural gas	1st
Bauxite	10th	Magnesium compounds	6th
Beryl	4th	Nickel	1st
Boron	4th	Palladium	1st
Cement	10th	Chromite	9th
Peat	4th	Cobalt	3d
Petroleum, crude	2d	Copper	6th
Phosphate rock	4th	Mica	3rd
Pig iron and crude steel	top 8	Diamonds	3d
Platinum	2d	Feldspar	12th
Rhenium	5th	Gemstones	3d
Salt	12th	Gold	5th
Silicon	5th	Sulfur	4th
Indium	4th	Tin	7th
Iodine	7th	Titanium sponge	2d
Iron ore	4th	Tungsten	2d
Magnesium metal	4th	Vanadium	2d

For a significant number of mineral commodities, including aluminum, gold, natural gas, nickel, petroleum and petroleum products, platinum group metals and titanium metal, Russia was also one of the world's major mineral exporters.

TABLE 1

EUROPE AND CENTRAL EURASIA: PRODUCTION OF SELECTED MINERALS IN 1997 1/2/

(Thousand metric tons, unless otherwise specified)

	Metals															
	Iron and steel			Ferroalloying materials			Aluminum				Copper (metal content)		Lead (metal content)		Zinc (metal content)	
Country	Iron ore (metal content)	Pig iron	Crude steel (gross weight)	Chromite (gross weight)	Manganese ore (gross weight)	Nickel, plant production	Bauxite	Alumina	Metal, primary	Metal, secondary	Mine	Refined	Mine	Refined	Mine	Refined
Western Europe:																
European Community (EU):																
Austria	500	3,965	5,196	–	–	2	–	–	–	52	–	76	–	23	–	–
Belgium	–	8,077	10,738	–	–	–	–	–	–	2	–	390	–	111	–	244
Denmark-Greenland	–	–	787	–	–	–	–	–	–	14	–	–	–	–	–	–
Finland	–	2,780	3,687	589	–	30	–	–	–	–	9	116	–	–	31	175
France	145	13,424	19,773	–	–	11	164	350	399	232	–	29	–	301	–	317
Germany	28	30,939	45,009	–	–	–	–	750	572	432	–	674	–	252	–	318
Greece	700	–	950	12	12	18	2,211	602	141	4	–	–	19	–	18	–
Ireland	–	–	337	–	–	–	–	1,273	–	–	–	–	–	11	195	–
Italy	–	11,348	25,537	–	6	–	–	850	188	443	–	86	12	212	8	268
Luxembourg	–	437	2,580	–	–	–	–	–	–	–	–	–	–	–	–	–
Netherlands	–	5,804	6,640	–	–	–	–	–	233	148	–	–	–	20	–	201
Portugal	–	431	860	–	–	–	–	–	–	–	107	–	–	6	–	4
Spain	58	3,926	13,644	–	–	–	–	1,110	360	154	38	292	24	88	172	364
Sweden	13,912	3,060	5,147	–	–	–	–	–	99	18	87	117	146	86	158	–
United Kingdom	(3/)	13,057	18,528	–	–	37	–	100	248	257	–	60	2	391	–	108
Total EU	15,343	97,248	159,413	601	18	98	2,375	5,035	2,240	1,756	241	1,840	203	1,501	582	1,999
European Free Trade Association (EFTA):																
Iceland	–	–	–	–	–	–	–	–	104	–	–	–	–	–	–	–
Norway	1,100	70	510	–	–	63	–	–	978	–	7	26	3	–	5	137
Switzerland e/	–	100	1,000	–	–	–	–	–	33	–	–	–	–	6	–	–
Total EFTA	1,100	170	1,510	–	–	63	–	–	1,115	–	7	26	3	6	5	137
Total Western Europe	16,443	97,418	160,923	601	18	161	2,375	5,035	3,355	1,873	248	1,866	206	1,507	587	2,136
Central and Eastern Europe:																
Albania	–	10	5	157	–	–	1	–	–	–	1	1	–	–	–	–
Bosnia and Herzegovina e/	35	100	110	–	2	–	75	40	4	10	–	–	(3/)	–	(3/)	–
Bulgaria	242	1,610	2,628	–	47	–	–	–	–	5	109	35	30	73	20	70
Croatia	–	–	69	–	–	–	–	–	–	18	–	–	–	–	–	–
Czech Republic	10	5,195	6,495	–	–	–	–	–	–	45	–	20	–	20	–	1
Hungary	–	1,190	1,689	–	72	–	743	76	33	65	–	12	–	–	–	–
Macedonia	1	20	90	5	–	3	–	–	–	4	7	–	–	25	15	20
Poland	–	7,033	11,591	–	–	–	–	–	51	3	470	445	103	66	185	172
Romania	146	4,557	6,674	–	100	–	127	282	165	–	23	23	17	24	29	25
Serbia and Montenegro	35	907	979	–	–	3	470	200	66	–	83	114	27	24	5	29
Slovakia	250	3,300	3,800	–	–	–	–	100	110	17	(3/)	25	1	–	3	1
Slovenia	–	–	400	–	–	–	–	15	72	2	–	–	–	7	–	–
Total Eastern and Central Europe	719	23,922	34,530	162	221	6	1,416	713	501	169	693	675	178	239	257	318

See footnotes at end of table.

TABLE 1--Continued
EUROPE AND CENTRAL EURASIA: PRODUCTION OF SELECTED MINERALS IN 1997 1/2/

(Thousand metric tons, unless otherwise specified)

	Industrial minerals						Mineral fuels		
Country	Hydraulic cement	Nitrogen (N content of Ammonia)	Phosphate rock (gross weight)	Potash (K2O equivalent)	Salt	Sulfur (all forms)	Coal	Natural gas (gross weight) (million cubic meters)	Petroleum, crude (million 42-gallon barrels)
Western Europe:									
European Community (EU):									
Austria	3,852	400	--	--	401	9	1,098	1,400	7
Belgium	7,001	500	--	--	--	300	--	--	--
Denmark-Greenland	2,683	2	--	--	600	11	--	7,929	84
Finland	960	6	650	--	--	760	--	--	--
France	18,600	1,800	--	700	6,760	1,107	6,979	3,000	13
Germany	37,000	2,471	--	3,423	15,787	1,160	223,891	22,473	20
Greece	12,000	83	--	--	200	70	58,000	--	3
Ireland	2,000	465	--	--	--	--	--	2,417	--
Italy	33,721	445	--	--	3,510	300	203	19,500	37
Luxembourg	580	--	--	--	--	--	--	--	--
Netherlands	3,300	2,500	--	--	5,500	288	--	88,000	21
Portugal	7,400	196	--	--	600	8	--	--	--
Spain	27,632	497	--	605	3,600	832	26,455	283	3
Sweden	2,320	--	--	--	--	160	--	--	--
United Kingdom	12,900	642	--	565	6,600	205	47,983	91,800	901
Total EU	171,949	10,007	650	5,293	43,558	5,210	364,609	236,802	1,089
European Free Trade Association (EFTA):									
Iceland	88	9	--	--	4	--	--	--	--
Norway	1,700	279	--	--	--	110	260	70,300	1,106
Switzerland e/	3,800	30	--	--	300	5	--	--	--
Total EFTA	5,588	318	--	--	304	115	260	70,300	1,106
Total Western Europe	177,537	10,325	650	5,293	43,862	5,325	364,869	307,102	2,195
Central and Eastern Europe:									
Albania	200	10	1	--	10	--	40	--	2
Bosnia and Herzegovina e/	200	1	--	--	50	(3/)	2,000	--	--
Bulgaria	2,100	1,200	--	--	1,600	100	30,566	--	(3/)
Croatia	2,134	331	--	--	17	--	49	1,717	12
Czech Republic	4,877	251	--	--	--	40	78,989	--	1
Hungary	2,811	250	--	--	--	30	15,565	4,513	9
Macedonia	500	--	--	--	--	6	6,500	--	--
Poland	14,910	1,700	--	--	3,968	1,973	201,121	4,725	2
Romania	7,298	1,000	--	--	2,623	252	33,307	34,078	49
Serbia and Montenegro	2,011	250	--	--	28	102	42,917	688	8
Slovakia	2,500	250	--	--	101	6	3,942	286	(3/)
Slovenia	900	--	--	--	5	--	5,000	--	14
Total Eastern and Central Europe	40,441	5,243	1	--	8,402	2,509	419,996	46,007	97

See footnotes at end of table.

TABLE 1--Continued

EUROPE AND CENTRAL EURASIA: PRODUCTION OF SELECTED MINERALS IN 1997 1 / 2 /

(Thousand metric tons, unless otherwise specified)

	Metals															
	Iron and steel			Ferroalloying materials			Aluminum				Copper (metal content)		Lead (metal content)		Zinc (metal content)	
									Metal							
Country	Iron ore (metal content)	Pig iron	Crude steel (gross weight)	Chromite (gross weight)	Manganese ore (gross weight)	Nickel, plant production	Bauxite	Alumina	Primary	Secondary	Mine	Refined	Mine	Refined	Mine	Refined
Central Eurasia:																
Armenia	--	--	--	--	--	--	--	--	--	--	9	--	--	--	--	--
Azerbaijan	NA	--	25	--	--	--	--	10	5	--	--	--	--	--	--	--
Belarus	--	--	1,220	--	--	--	--	--	--	--	--	--	--	--	--	--
Estonia	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Georgia	--	--	104	--	30	--	--	--	--	--	6	--	(3/)	--	2	--
Kazakstan e/	7,500	3,000	3,900	1,800	400	--	3,100	1,050	--	--	316	301	31	76	225	170
Kyrgyzstan	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Latvia	--	--	300	--	--	--	--	--	--	--	--	--	--	--	--	--
Lithuania	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Moldova	--	--	255	--	--	--	--	--	--	--	--	--	--	--	--	--
Russia	70,800	37,327	48,441	150	--	230	3,350	2,300	2,906	--	505	610	20	52	121	185
Tajikistan	--	--	--	--	--	--	--	--	206	--	--	--	1	--	--	--
Turkmenistan	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ukraine	29,200	20,561	25,600	--	3,040	--	--	1,000	101	40	--	--	--	18	--	2
Uzbekistan	--	--	381	--	--	--	--	--	--	3	80	115	--	--	--	50
Total Central Eurasia	107,500	60,888	80,226	1,950	3,470	230	6,450	4,360	3,218	N/A	916	1,026	52	146	348	407
Total Europe and Central Eurasia	124,662	182,228	275,679	2,713	3,709	397	10,241	10,108	7,074	N/A	1,857	3,567	436	1,892	1,192	2,861
Total United States	40,022	50,110	98,500	--	--	16	NA	5,093	3,603	N/A	1,940	2,450	459	1,449	632	367
Total World	592,501	583,873	796,474	13,398	22,799	1,001	122,928	45,251	23,617	N/A	11,892	13,560	3,099	5,771	6,289	7,872
Western Europe as a percentage of world total	2.78	16.68	20.20	4.49	0.08	16.08	1.93	11.13	14.21	N/A	2.09	13.76	6.65	26.11	9.33	27.13
Central and Central Europe as a percentage of world total	0.12	4.10	4.35	1.21	0.97	0.60	1.15	1.58	2.12	N/A	5.83	4.98	5.74	4.14	4.09	4.04
Central Eurasia as a percentage of world total	18.10	10.40	10.10	14.60	15.20	23.00	5.20	9.60	13.60	N/A	7.70	7.60	1.70	2.50	5.50	5.20
Europe and Central Eurasia as a percentage of world total	21.04	31.21	34.61	20.25	16.27	39.66	8.33	22.34	29.95	N/A	15.62	26.31	14.07	32.78	18.95	36.34

See footnotes at end of table.

TABLE 1--Continued

EUROPE AND CENTRAL EURASIA: PRODUCTION OF SELECTED MINERALS IN 1997 1 / 2 /

(Thousand metric tons, unless otherwise specified)

	Industrial minerals						Mineral fuels		
Country	Hydraulic cement	Nitrogen (N content of Ammonia)	Phosphate rock (gross weight)	Potash (K_2O equivalent)	Salt	Sulfur (all forms)	Coal	Natural gas (gross weight) (million cubic meters)	Petroleum, crude (million 42-gallon barrels)
Central Eurasia:									
Armenia	325	--	--	--	26	--	--	--	--
Azerbaijan	315	--	--	--	15	--	--	5,947	66
Belarus	1,876	590	--	3,247	1	--	--	283	9
Estonia	400	169	--	--	--	--	--	--	--
Georgia	91	84	--	--	--	--	18	--	1
Kazakstan e/	661	75	1,700	--	--	945	7,260	8,100	190
Kyrgyzstan	658	--	--	--	--	--	1,524	--	1
Latvia	246	--	--	--	--	--	--	--	3
Lithuania	600	385	--	--	--	--	--	--	1
Moldova	122	--	--	--	--	--	36	--	6
Russia	26,600	7,150	7,500	3,400	1,400	3,750	244,000	571,151	2,180
Tajikistan	35	20	--	--	--	--	27	--	(3/)
Turkmenistan	450	61	--	--	--	9	--	25,485	35
Ukraine	5,100	3,400	--	100	2,500	100	76,300	18,100	30
Uzbekistan	3,500	950	--	--	--	415	3,130	51,200	57
Total Central Eurasia	40,979	12,884	9,200	6,747	3,942	5,219	332,295	680,266	2,579
Total Europe and Central Eurasia	258,957	28,452	9,851	12,040	56,206	13,053	1,117,160	1,033,375	4,871
Total United States	84,225	14,300	43,280	1,400	41,475	12,020	988,768	535,188	3,143
Total World	1,511,760	102,887	134,667	25,676	199,693	54,034	4,742,089	2,366,248	26,616
Western Europe as a percentage of world total	11.74	10.04	0.48	20.61	21.96	9.85	7.69	12.98	8.25
Eastern and Central Europe as a percentage of world total	2.68	5.10	(4/)	(4/)	4.21	4.64	8.86	1.94	0.36
Central Eurasia as a percentage of world total	2.70	12.50	6.80	26.30	2.00	9.70	7.00	28.70	9.70
Europe and Central Eurasia as a percentage of world total	17.13	27.65	7.32	46.89	28.15	24.16	23.56	43.67	18.30

NA Not available.

1/ Some of the individual entries in this table may differ from those appearing in individual country production tables elsewhere in this volume owing to the inclusion in this table of data received at a later date.

2/ Includes data available through May 5, 1998. Data in country chapters may be of later origin and not correspond to data listed above.

3/ Less than 1/2 unit.

4/ Less than 0.01 percentage.

THE MINERAL INDUSTRY OF

ALBANIA

By Walter G. Steblez

In 1997, Albania experienced political and social problems wing to a difficult process of transition to democratic institutions nd a market economy system. These problems resulted in new lections in midyear. The economy was moribund for most of the ear and the country's gross domestic product declined by 8% in 997, which had a negative effect on many sectors of the minerals ndustry. The chief mineral commodities that traditionally had een produced in Albania were chromite, copper, ferrochromium, ickeliferous iron ore, and petroleum refinery products, which until recently, constituted the dominant component of the country's foreign exchange earnings. In 1997, however, the output of chromite declined by about 33%, that of copper ore by about 87%, and that of petroleum, by about 26%. Additionally, the production of bitumen, coal, and natural gas declined by about 15%, 42%, and 22%, respectively. The production of nickeliferous iron ore ceased in 1993. (*See table 1.*) A more detailed presentation of Albania's mineral industry is given in the Mineral Yearbook chapter on Albania for 1996.

TABLE 1
ALBANIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/		1993	1994	1995	1996	1997 e/
METALS						
Bauxite e/		2,000	2,000	1,000	1,000	500
Chromium:						
Chromite, gross weight e/	thousand tons	281	223	243	236	157 3/
Marketable ore	do.	82	107	129	113	84 3/
Concentrate	do.	33	11	31	30	22 3/
Ferrochromium	do.	35	33	43	31 r/	31 3/
Cobalt: e/						
Mine output, Co content 4/		-- r/	--	--	--	--
Plant production, Co content 5/		1	--	--	--	--
Copper:						
Ore:						
Gross weight	thousand tons	239	277	258	188 r/	25 3/
Concentrate		14,000	9,000	17,000	11,000 r/	1,000 3/
Cu content e/		3,200	2,000	3,800	2,500 r/	220
Metal, primary:						
Smelter		2,300	2,000	2,900 r/	2,902 r/	-- 3/
Refined e/		1,500	1,000	1,000	1,000	--
Iron and steel:						
Iron ore, nickeliferous:						
Gross weight	thousand tons	150	--	--	--	--
Fe content e/	do.	85	--	--	--	--
Metal: e/						
Pig iron		10,000	10,000	10,000	10,000	10,000
Crude steel		5,000	5,000	5,000	5,000	5,000
Rolled steel		1,000	1,000	1,000	1,000	1,000
Nickel: e/						
Mine output, Ni content		75	75	--	--	--
Plant production, Ni content		50	50	--	--	--
Metal, Ni cathode		20	20	--	--	--
INDUSTRIAL MINERALS						
Cement, hydraulic e/	thousand tons	200	200	200	200	200
Clay, kaolin e/		500	500	500	500	500
Dolomite e/		50,000	50,000	50,000	50,000	50,000
Fertilizer, manufactured: e/						
Phosphatic		10,000	10,000	10,000	5,000	5,000
Urea		4,000	4,000	4,000	3,000	3,000
Nitrogen, N content of ammonia e/		15,000	15,000	15,000	15,000	10,000
Olivinite		300	300	300	300	300
Phosphate rock (12% - 15% P_2O_5) e/		1,500	1,500	1,000	1,000	1,000
Pyrite, unroasted e/		7,000	7,000	5,000	-- r/	--
Salt e/		10,000	10,000	10,000	10,000	10,000
Sodium compounds n.e.s., soda ash, calcined e/		150	150	100	100	100
Sulfuric acid e/		1,000	1,000	1,000	1,000	500
MINERAL FUELS AND RELATED MATERIALS						
Asphalt and bitumen, natural 6/	thousand tons	19	34	33	20	17 3/
Coal, lignite	do.	135	120	81	69 r/	40 3/
Gas, natural, gross production 7/	million cubic meters	82	52	28	23 r/	18 3/
Petroleum:						
Crude:						
Gross weight	thousand tons	586	535	521	488 r/	360 3/
Converted	thousand 42-gallon barrels	3,900	3,500	3,500	3,300	2,400
Refinery products e/	do.	1,000	1,000	1,000	1,000	500

e/ Estimated. r/ Revised.

1/ Table includes data available through March 1998.

2/ In addition to the commodities listed, a variety of industrial minerals and construction materials (common clay, quartz, titanomagnetite, stone, and sand and gravel) are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

3/ Reported figure.

4/ Calculated from reported and estimated weight of nickeliferous ore; the amount of cobalt recovered, if any, is conjectural.

5/ Figures represent cobalt content of estimated production of commercially marketable cobalt salts produced within Albania from domestically mined nickeliferous iron ore.

6/ Includes asphalt and bitumen produced at petroleum refineries.

7/ Separate data on marketable production are not available, but gross and marketed output are regarded as being nearly equal.

TABLE 2

ALBANIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity		Location of main facilities (all state-owned)	Annual capacity
Cement		Elbasan, 32 kilometers southeast of Tirana; and Kruje, 20 kilometers northwest of Tirana Shkoder, 85 kilometers northwest of Tirana; and Vlore, southwest of Tirana	1,200
Chromite		Bater (including Bater I and II and Martanesh), 40 kilometers northwest of Tirana	450
Do.		Bulquize (including Bulquize south, Fush, Termove, and Todo Maco), 35 kilometers northwest of Tirana	450
Do.		Kalimash, 60 kilometers north of Tirana	250
Do.		Kam, 70 kilometers north of Tirana	100
Do.		Klos, 20 kilometers northeast of Tirana	50
Do.		Pogradec (including Katjiel, Memelisht, Pojske, Pishkash, and Prrenjas), 50 kilometers east of Tirana	100
Ferrochromium		Burrel, 35 kilometers northeast of Tirana	40
Do.		Elbasan, 32 kilometers southeast of Tirana	36
Copper:			
Ore		Fushe-Arrez, 80 kilometers north of Tirana	350
Do.		Gjejan, 100 kilometers northeast of Tirana	150
Do.		Golaj (including Nikoliq and Pus), 120 kilometers northeast of Tirana	150
Do.		Kurbnesh-Perlat, 55 kilometers northeast of Tirana	100
Do.		Rehove, 110 kilometers southeast of Tirana	100
Do.		Reps (including Gurch, Lajo, Spac, and Thurr), 55 kilometers north of Tirana	350
Do.		Rreshen, 50 kilometers north of Tirana	50
Do.		Shkoder (including Palaj, Karma I and II), 85 kilometers northwest of Tirana	100
Smelter		Kukes, 110 kilometers northeast of Tirana	6
Do.		Lac, 35 kilometers northwest of Tirana	7
Do.		Rubik, 50 kilometers north of Tirana	4
Iron ore		Prrenjas (Bushtrica, Prrenjas, Skorska I and II), 70 kilometers southeast of Tirana	650
Do.		Guri i Kuq (including Cervenake, Grasishta, Guri i Kuq, Hudenisht and Guri Pergjrgjur), 25 kilometers east of Tirana	500
Steel		"Steel of the Party" Metallurgical Combine at Elbasan	150
Nickel, smelter		Elbasan	6
Coal, lignite		Maneze, Mezes, and Valias Mines in Tirana Durres area; Krabe Mine, 20 kilometers southeast of Tirana; Alarup and Cervnake Mines, in Pogradec area, 80 kilometers southeast of Tirana; Mborje-Drenove Mine in Korce area, 85 kilometers southwest of Tirana; and Memaliaj Mine in Tepelene area, 110 kilometers south of Tirana	2,500
Natural gas	million cubic feet	Gasfields on southwest Albania between Ballsh and Fier	16,000
Petroleum:			
Crude	42-gallon barrels per day	Oilfields at Marineze, Ballsh, Shqisht, Patos, Kucova, Gorrisht, and others	35,000
Refined	do.	Refineries: Ballsh, Cerrik, Fier, and Stalin	33,000

THE MINERAL INDUSTRY OF

ARMENIA

By Richard M. Levine

Armenia's mineral industry in recent years was primarily involved in mining nonferrous metals and industrial minerals. Armenia has large molybdenum reserves and had been mining one-third of the former Soviet Union's (FSU) output of molybdenum; the molybdenum was associated with copper. Armenia also mined copper and copper-zinc deposits and has a native gold mining industry. Significant byproduct constituents in the country's nonferrous ores include barite, gold, lead, rhenium, selenium, silver, tellurium, and zinc.

Armenia has a large industrial minerals industry and was the largest producer of perlite in the FSU. It produced a number of other industrial minerals, including clays, diatomite, dimension stone, limestone, salt, and semiprecious stones, and had a diamond cutting industry. However, Armenia had practically no mineral fuel production in 1997 and was dependent on imported mineral fuels.

Regarding mineral resources, in Abovian and Hrazdan there are two iron ore deposits considered to have industrial potential. These deposits are estimated to contain 400 million metric tons (Mt) and 150 Mt, of ore, respectively. The average iron content of ore in the Abovian deposit is 28% and in the Hrazdan deposit 32%. The iron ores of these deposits, in addition to their main component iron, contain rare earth elements of the cerium and yttrium group, as well as dispersed germanium, gallium, thallium, niobium, and tantalum. The Hrazdan deposit also contains zirconium.

Armenia's most significant mineral resource base is of copper-molybdenum ores. The Kadzharan deposit contains more than 90% of the country's molybdenum reserves and is considered a potential source of molybdenum for the next 100 years. The molybdenum content of the ore at Kadzharan varies from 0.001% to 0.1%. Other ore constituents include bismuth, germanium, gold, rhenium, selenium, silver, and tellurium. The deposit is mined by the Zangezur mining and beneficiation enterprise, which is the largest enterprise in the mining industry.

Lead and zinc ores are the second most common nonferrous ores and are located in lead-zinc, copper-zinc, and complex gold-polymetallic ore deposits. The lead content of the ores range from 1.5% to 3%, the zinc content from 2% to 6%, and the copper content from 0.5% to 1%. These ores also contain bismuth, cadmium, indium, and selenium as well as precious metals. Along with byproduct gold, there are native gold deposits in Zod, Megradzor, and Terterasar.

Regarding industrial minerals, salt deposits having estimated reserves of between 150 to 200 billion metric tons have been found near Yerevan. Armenia's volcanic rocks are useful building material. The white, pink, orange, and black tuff are light, durable, and easily processed. They serve as a main construction and decorative material. Estimated reserves of tuff in Armenia is 3 billion cubic meters. The country has abundant deposits of marble, granite, high quality travertine, and limestone and small deposits of gypsum.

There are also deposits of natural mineral sorbents such as bentonite. The Sarigyugh deposit contains a high quality alkaline bentonite resource base. There are three identified deposits of perlite in Armenia with two deposits (Aragats and Jzaber) under development. The only identified zeolite deposit is the Noyemberian and has estimated resources of 150 to 170 Mt. The resource base of diatomite consists of five deposits. There are reportedly considerable undiscovered diatomite resources.

Armenia is rich in semiprecious and ornamental stones such as agates, amethyst, jasper, obsidian, onyx, and turquoise. Obsidian is found in northern Armenia, particularly in the Hrazdan region. Armenia produces jewelry and decorative art works made from these stones (Armenian Embassy in the United States, 1998, Natural resources, accessed August 4, 1998 at URL http://www.armeniaemb.org/investment/natural.htm).

Armenia has no fossil fuel production with the exception of a small amount of coal, although it does contain hydroelectric and nuclear electric generating capacity. Its only sources of fuel since blockades by Azerbaijan and Turkey were imposed in 1991 and 1993, respectively, are of gas shipments from Turkmenistan through a pipeline from Georgia, along with small shipments of petroleum refinery products from Georgia's Batumi refinery (United States Department of Energy, Energy Information Administration, December 1996, Armenia, accessed August 5, 1998 at URL http://www.eia.doe.gov.emeu/cabs/armenis.html).

Since the imposition of the blockades, insuring an adequate energy supply has been a critical issue for the country. In 1997, the country generated 6.0211 billion kilowatt/hours (kWh) of electricity, which was 3.1% less than in 1996. In 1997 compared with 1996, generation at thermal power plants rose 30.8%, while at hydroelectric plants it fell by 11.7% and at the Armenian Nuclear Power Plant it fell by 31.1%. In 1997, the nuclear plant generated 1.6002 billion kWh (26.6% of total electricity generation), thermal power plants generated 3.0316 billion kWh (50.3%) and hydroelectric plants generated 1.3893 billion kWh (23.1%). In 1997, Armenia generated 660,600 gigacalories of heat energy, which was 5.7% more than in 1996 (Interfax Statistical Report, 1998b).

In June, the Government of Armenia decided to allow previously classified information about mineral reserves to be published. All information about gold, mercury, silver, and uranium reserves had been classified secret as of February 17, 1992, as was information about reserves of thorium, molybdenum, zirconium, and zinc. The Government will allow information to be published on the size of ore bodies and their average metal content, on the production of mines and processing plants, and on the content of gold in ores and concentrates. The release of this information is intended to facilitate foreign investment in mineral projects (Interfax Mining and Metals Report, 1997b).

In August 1998, the State Commission for Mineral Reserves announced that reserve data, which had all been based on the Soviet reserve classification system, would be reevaluated based on a new classification system that would, while still preserving the Soviet reserve system categories, add a number of additional elements to the system, including elements to account for the value and size of reserves and a coefficient to account for the value per ton of a resource versus its cost to develop (Interfax Mining and Metals Report, 1998a).

Regarding newly discovered reserves, in 1997, the Armenian State Commission for Mineral Reserves confirmed 17 metric tons (t) of gold reserves at the Azatek lode deposit 140 kilometers east of Yerevan. The lode reportedly also contains 400 t of silver, 13,500 t of copper, and small quantities of antimony, lead, and zinc. Azatek was the first gold field to have its reserves confirmed by the State Commission that was established in 1993, although there are reportedly larger gold lodes in the country. The State Commission had confirmed reserves at 28 new industrial minerals deposits and listed additional reserves at the Zod gold lode deposit (Interfax Mining and Metals Report, 1998b).

Since the 1994 cease-fire with Azerbaijan, Armenia's gross domestic product (GDP) began to increase. In 1997, GDP increased by 3.1% compared with 1996, and industrial output increased by 0.9% (Interfax Statistical Report, 1998a).

Of the country's 440 industrial enterprises, 115 registered increased outputs compared with those of 1996. Among individual enterprises with the biggest increases in output were the Ararat cement works (13.2%), the Zangezur copper and molybdenum plant (9%), and the Sapfir (Sapphire) plant producing industrial stones (26.8%). Compared with those of 1996, at the Shogakhn diamond-cutting plant output fell by 24.9%, at the Kanaker aluminum fabrication plant by 47.8%, at the Yerevan Jewelry Plant by 62.2%, and at the Armzoloto gold mining enterprise by 76% (Interfax Statistical Report, 1998a; Interfax Mining and Metals Report, 1998j).

In 1997, output from Armenia's mining and metals industry decreased by 21.4% compared with that of 1996. Output for molybdenum concentrate with an estimated metal content of 51%, however, rose to 3,273 t in 1997 from 3,116 t in 1996. Nearly all the molybdenum concentrate was produced at the Zangezur copper-molybdenum plant, which mines the Kadzharan deposit, in the Kapan district in southern Armenia.

At the Zangezur copper-molybdenum plant output of copper in concentrate increased to 5,288 t from 4,486 t in 1996, but copper production from the nearby Kapan Mine fell by nearly one-half to 1,470 t from 2.465 t in 1996. In 1997, the Kapan Mine increased production of zinc in concentrate to 610 t compared with 557 t in 1996 (Interfax Mining and Metals Report, 1998e).

Plans called for privatizing all major mining and metallurgical enterprises between 1998 and 2000. These plans are part of the third phase of the privatization program. Enterprises to be privatized include the Zangezur copper-molybdenum mining and beneficiation complex, the Agarak copper-molybdenum mining and beneficiation complex, the Kapan copper-zinc mining complex, the Armzoloto gold mining complex, the Kanaker aluminum fabrication plant, the Akhtala copper mining and beneficiation complex, and the Shogakhn diamond-cutting enterprise. Although privatization in the first and second phases was based on voucher certificates, privatization in the third phase is to be for money only (Interfax Mining and Metals Report, 1998f).

In the nonferrous metals sector, an Armenian-Iranian joint venture, Ar-Al, was formed to produce aluminum sections and consumer goods. The venture was to be owned by the Kanaker aluminum fabrication plant in Yerevan (17%), by the Armenian Government (49%), and by Faragam of Iran (34%). The Ar-Al joint venture was scheduled to go into operation in January 1998. In its first year, it would require investment in cold-and hot-rolled presses. The Kanaker plant had made some of its own capacity available, and the Iranian side was to upgrade technology and production processes. Ar-Al anticipated manufacturing aluminum sections, food containers for passenger aircraft, radiators, and solar-powered water heaters. According to Armenian Government statistics, the Kanaker plant produced 112 t of aluminum foil and 125 t of semifabricated aluminum products in the first 9 months of 1997 (Interfax Mining and Metals Report, 1998d).

The Zangezur copper-molybdenum mining and beneficiation enterprise had been developing the Kadzharan deposit by open-pit mining since 1958; output peaked at 9.2 million metric tons per year (Mt/yr) of ore in the 1980's. Production data on copper and molybdenum output in Armenia was classified as secret during the Soviet period and by Armenia following independence; past and present production data are only now becoming available. According to recent reporting, Zangezur produced 7,800 t of molybdenum concentrate with a metal content of about 50% and 6,100 t of copper in copper concentrate in 1990 (Interfax Mining and Metals Report, 1997e).

In 1991, the Zangezur enterprise began to suffer severe economic problems as the Soviet Union began disintegrating. Only in 1995 did production begin to revive as the Government was able to invest in the enterprise. In 1995 and 1996, Zangezur was reportedly working at about 50% of its capacity, producing 3,116 t of molybdenum concentrate and 4,486 t of copper in concentrate from 3,115 Mt of ore in 1996 (Interfax Mining and Metals Report, 1997e).

Although Zangezur was producing almost the entire molybdenum output for the country, it produced less than one-half of the country's total copper in concentrate production of 9,100 t in 1996 (Karmanov and Kozyrev, 1998). Plans for 1997 called for Zangezur to produce 3,400 t of molybdenum concentrate and 5,000 t of copper in a 20% concentrate. At present, about 20% of the molybdenum extracted in ore and 30% of the copper end up in waste dumps. The molybdenum concentrate from Zangezur had been processed in Russia at the Pobedit metallurgic plant in North Ossetiya and the Skopino plant in the Chelyabinsk region and also in Uzbekistan at the Chirchik hard metals plant. During the Soviet period, the copper concentrate was processed in Armenia at the Alaverdi plant which was closed because of environmental concerns.

The copper concentrate was bought mainly by Iran and also by the Manes-Vallex joint venture, which is based in northern Armenia; the joint venture is 53% owned by the Liechtenstein-registered Vallex Corp. The molybdenum concentrate is exported by a Dutch firm, the name of which Armenian officials would not disclose. The molybdenum concentrate is transported by road to Yerevan, then by rail to the Georgian port of Poti on the Black Sea, and then shipped to Rotterdam. Armenia planned to construct its own facility to process molybdenum and began negotiations with foreign firms to design a plant to produce up to 8,000 metric tons per year (t/yr) of molybdenum trioxide (Interfax Mining and Metals Report, 1997e).

Since April, the Agarak copper-molybdenum mining and beneficiation complex, also in southern Armenia, has been virtually idle since April owing to a lack of working capital. The complex was negotiating a joint venture with the British company Derek Raphael that would expand Agarak's resource base by developing the Megran deposit close to the border with Iran. In 1996, Agarak mined 866,000 t of ore to produce 2,130 t of copper concentrate and 117 t of molybdenum concentrate (Interfax Mining and Metals Report, 1997a).

In the northern part of the country, Nove Mtebi, a Georgian company, was planning to finance the renovation of the Armenian state-owned Akhtala mining and beneficiation complex, which produced from 10,000 to 12,000 t of copper concentrate in the 1980's. The complex would restart operations at the Akhtala polymetallic and the Shamlug copper deposits. These had been worked by underground mines. Akhtala had been part of the Alaverdi mining and metallurgical complex, but mining ceased with the closure of Alaverdi in 1989. Plans were to increase production to above former levels. The complex would then supply the Madneuli metallurgical plant in Georgia with copper, lead, and zinc concentrates. Ore from Akhtala reportedly contains significant byproduct gold and silver (Interfax Mining and Metals Report, 1997i).

In October, Armzoloto, the country's chief gold producer, announced that in accordance with the Soviet reserve classification system, the country has about 200 t of proven gold reserves, which, under the Soviet system, were deemed ready for development. The Zod gold lode, close to the border with Azerbaijan, was said to contain 160 t of reserves, and the nearby Megradzor gold lode, 20 t (Interfax Mining and Metals Report, 1997d).

In 1996, Armzoloto produced 244 kilograms (kg) of gold, and plans called for production to increase to 850 kg in 1997, 1,250 kg in 1998, 1,600 kg in 1999, and 2,000 kg in 2000. Armenia had produced 31.4 t since its gold industry was established in 1976; of that, 20 t was produced from ore mined in Armenia, and the remaining amount, from ore shipped in from Georgia, Kazakstan, and Uzbekistan. Gold production peaked at about 2.5 t/yr in the mid-1980's (Interfax Mining and Metals Report, 1997d).

In the gold production sector, Armenia signed an agreement with First Dynasty Mines Ltd., a U.S.-Canadian firm, to develop mines at the Zod and the Megradzor lodes in northeastern Armenia; gold production eventually should increase to about 13 t/yr. The agreement, signed on October 1, was preliminary and had to be appraised by four Armenian ministries and win the approval of the full Government. It was hoped that a finalized 20-year agreement would be signed by the end of the year (Interfax Mining and Metals Report, 1997f).

First Dynasty completed the appraisal of the two Armenian gold deposits and drafted a preliminary feasibility study for their development. First Dynasty reportedly assessed Zod to contain 10.7 Mt of minable ore grading 6 grams per ton (g/t) of gold. A mill at the site would have the capacity to process initially 1 Mt/yr of ore increasing to 2.5 Mt/yr. Megradzor was assessed to hold 815,000 t of ore grading 12.25 g/t of gold (Interfax Mining and Metals Report, 1998h).

First Dynasty engineers expected to begin development in August 1998. It planned to construct the new mill within 1 year. Until the mill is completed, ore will be milled at the Ararat gold recovery plant 120 km from the deposit. The agreement also called for the renovation of the existing mill at the Ararat gold recovery plant. First Dynasty envisaged producing up to 6 t/yr of gold by the end of 1999, of which it would own a 50% share of the output (Interfax Mining and Metals Report, 1998c).

In December, Armenia and First Dynasty postponed signing the agreement on the joint development of the Zod and the Megradzor gold lode deposits because a number of points within the agreement had to be reworked. The Armenian Ministry of Environmental Protection objected to the construction of the mill at Zod because it was too close to the Sevan National Park (Interfax Mining and Metals Report, 1997c).

In June 1998, the Government of Armenia formally approved the agreement with First Dynasty for development of the Zod and the Megradzor deposits with the name of the new joint venture the Ararat Gold Recovery Company (First Dynasty Mines Ltd., June 24, 1998, Company press release, accessed June 25, 1998, on the World Wide Web at URL http://biz.yahoo.com/prnews/980624-first_dyna_1.html).

Armzoloto had been developing the Zod field since 1976. Another firm from the United States, RV Investment Group Services LLS, had signed an agreement to develop this field with authorities in Azerbaijan. Azerbaijan is claiming that the majority of this field, which Azerbaijan calls Sutlinskoye, is located in Azerbaijan. RV Investment is claiming that 73% of the field lies on Azerbaijani territory and that this portion contains 80 t of gold. The president of First Dynasty Mines stated that he felt the Azerbaijanis were basing their claim on distorted geographical coordinates (Interfax Mining and Metals Report, 1997f).

Decalite, a U.S. company and a member of Belmont Holding, acquired the Aragats perlite plant, which quarries and mills perlite. The plant, which is 80 km west of Yerevan, can quarry and process up to 60,000 cubic meters per year of perlite. The Aragatts deposit reportedly contains an estimated 85 million cubic meters (Mm^3) of mineral reserves, of which more than 82% is perlite, 11%, pumice, and 6%, gem-quality obsidian. Armenian geologists stated that the country possesses three perlite deposits, including Aragats, containing 156 Mm^3 of perlite (Interfax Mining and Metals Report, 1998g).

In November, the European Union (EU) decided to allocate ECU 978,000 to Armenia during the next 12 months under its Technical Assistance to the Commonwealth of Independent States (TACIS) program for a project to use nonmetallic natural resources. The project involves using basalt, perlite, and other materials to produce heat, sound, and acid proof materials. The Kamen i Silikat (Stone and Silicate) firm will represent Armenia in the project, which intends to increase output of these products for export by between 30% and 40% (Interfax Mining and Metals Report, 1997g).

At Armenia's state-owned Shogakhn diamond cutting enterprise in Nor-Achin, output was 30% lower in 1997 than that of 1996. Shogakhn, founded in 1981, has the capacity to produce between 100,000 and 120,000 carats per year of gems cut to between 0.01 and 1.5 carats. Starting in January 1998, Shogakhn, which was already purchasing rough diamonds from De Beers, was to become a De Beers sight-holder under an agreement reached with De Beers in November. Shogakhn would become a client of the De Beer's Central Selling Organization (CSO) and attend regular CSO sights on the same terms as other buyers (Interfax Mining and Metals Report, 1997j).

Shogakhn planned to raise purchases of rough diamonds from De Beers to between $50 million and $60 million per year. Purchases from De Beers had amounted to about $40 million during an 18-month period in 1996 and 1997. In 1997, Shogakhn was producing between $35 million and $38 million worth of cut stones, mostly for export to Belgium, Cyprus, and Japan. One of Shogakhn's main customers in Belgium was Backes and Strauss, which was also providing Shogakhn with about $5 million to $6 million per year in credit to buy rough stones. The Armenians, also were negotiating with Russia in an attempt to resume shipments of Russian stones under tolling agreements stopped in 1996. The Russians and Armenians were discussing trade of about 215,000 carats per year (Interfax Mining and Metals Report, 1997j).

Additionally, in September, the Association of Armenian Diamond Manufacturers drafted a program for the development of the gem industry up to 2001. The program calls for setting up a network of small diamond-cutting plants (Interfax Mining and Metals Report, 1997h). In 1997, the Belgium Arslanian Cutting Works BVBA brought two cutting centers into operation in mid-September. The Armenian Government also was planning to open a diamond-cutting shop in Nagorno Karabakh. Armenia was exporting about $50 million worth per year of cut diamonds, of which Shogakhn accounted for almost 80% of the sales (Interfax Mining and Metals Report, 1997j).

Armenia is reviving production of nonferrous metals and industrial minerals, with foreign investment playing an important role in both restoring output and creating facilities to produce value added products. Although increasing its production of copper, cut diamonds, and gold would be significant for the Armenian economy, Armenia could become a major regional molybdenum supplier if it reaches its capacity for molybdenum production. Reviving mineral production has progressed despite the great economic hardships Armenia is enduring because of the blockade imposed by Azerbaijan and Turkey. Were Armenia to achieve a resolution acceptable to all parties to the political problems in the region caused by its conflict with Azerbaijan over the status of Nagorno-Karabakh and other issues resulting from that conflict, Armenia potentially could make more rapid progress in developing its mineral industries.

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Major Sources of Information

U.S.-Armenian Business Council
122 C St., NW, Suite 350
Washington, DC 20001
Telephone: (202)393-3745
Fax: (202)393-3624

Armenian Chamber of Commerce and Industry
39 Hanrapetutyan St.
Yerevan 375010, Armenia
Telephone: (374-2) 56-54-38
Fax: (374-2) 56-46-95
Telex: 243322 ALFASU

Yerevan Stock Exchange
22 Saryan St.
Yerevan-22, Armenia
Telephone: (374-2)535-823, 536-162
Fax: (374-2)525-801, 151-148

Adamand Yerevan Stock and Commodity Exchange
5 Hanrapetutyan St.
Yerevan-33, Armenia

Telephone: (374-2)271-936
Fax: (374-2)276-921
Gyumri Stock Exchange
244 Abovyan St.
Gyumri 377504, Armenia
Telephone: (374-69)23109
Fax: (374-69)21023
Ministry of Finance and Economy
1 Melik Adamyan St.
Yerevan 375010, Armenia
Telephone: (374-2)527-082
Fax: (374-2)151-154, 523-745
Ministry of Energy
2 Government Bldg.
Republic Square
Yerevan 375010, Armenia
Telephone: (374-2)521-964
Fax: (374-2)151-687
Ministry of Environmental Protection
37 Moskovyan St.
Yerevan 375002, Armenia
Telephone: (374-2)530-741
Fax: (374-2)534-902, 538-613
Ministry of Industry and Trade
2 Government Bldg.
Republic Square
Yerevan 375010, Armenia
Telephone: (374-2)521-877, 520-579
Fax: (374-2)151-084, 523-564
Ministry of Transportation
10 Zakyan St.
Yerevan 375015, Armenia
Telephone: (374-2)563-391
Fax: (374-2)523-200
Customs Department of Armenia
4 Kochar St., 375033
Yerevan 375010, Armenia
Telephone: (374-2)225636, 62-20
Tax Inspection Administration
3 Movses Khorenatsy St.
Yerevan 375015, Armenia
Telephone: (374-2)538-101, 59-51
Fax: (374-2)151-967
Protection of Intellectual Property
For Patents and Trademarks —
ArmPatent (State Patent Office)
3 Government Bldg., Main Ave.
375010 Yerevan, Armenia
Telephone: (374-2)520-673
Fax: (374-2)580-63
State Administration for Statistics and State Register
3 Government Bldg.
Republic Square
Yerevan 375010, Armenia
Telephone: (374-2)524-213
Fax: (374-2)521-021
Telex: 243497

TABLE 1
ARMENIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES 1/

(Thousand metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997
Bentonite		100	100	110 2/	275 2/	300
Cement		200	200	228 2/	282 2/	300
Copper, concentrate, Cu content	metric tons	500	500	8,080 2/	9,080 2/	9,300
Gold	kilograms	500	500	514 2/	244 2/	850
Limestone		500	100	26 2/	441 2/	500
Molybdenum, concentrate, Mo content	metric tons	500	500	1,500	1,600	1,700
Perlite		10	10	NA	NA	NA
Salt	metric tons	50,000	30,000	32,800 2/	26,400 2/	27,000
Silver	kilograms	NA	NA	184 2/	626 2/	1,000

NA Not available.
1/ Includes data available through December 11, 1998.
2/ Reported figure.

THE MINERAL INDUSTRY OF

AUSTRIA

By Harold R. Newman

Although the mining industry has had a long tradition in Austria, the metal mining sector continued to decline in 1997, principally due to high operating costs, low ore grades, environmental problems, and increased competition. This was not the case with the industrial minerals sector, which has been producing a number of important minerals. Austria has been considered a significant world producer of graphite, magnesite and talc. Recycling activities were also increasing. *(See table 1.)* On January 1, 1995, Austria, along with Finland and Sweden, acceded to the European Union (EU). This entry extended and reinforced the EU's mineral industry. In Austria, graphite, iron ore, magnesite, talc, and tungsten were the main mineral products. Dependent on foreign trade, Austria has had an open economy closely linked to the economies of other EU member countries, especially Germany.

In the last several years, the Austrian mineral industry has turned away from coal and base-metal mining toward the industrial minerals sector. Most of the growth in the mineral resources area has been in the production of industrial minerals for which operations have been developed by the private sector.

All the metal mines, except for the iron ore operation at Erzberg, and the tungsten operation at Mittersill, were closed. The Mittersill Mine was reopened in 1995 after being closed for 2 years for economic reasons. Mittersill, together with two graphite mines and a mica operation, represented the underground mining sector. A small portion of the mineral industry was still under Government control. *(See table 2.)* All the aluminum produced in Austria in 1997 was secondary. The Ranshofen smelter, with a capacity of 50,000 metric tons per year (t/yr), was the larger of two secondary smelters. The Government-owned facility was scheduled to be privatized by 1998. The operation consisted of a smelter and casthouse, a rolling mill, a press mill, and an automobile wheel plant. Scrap was obtained from private collecting organizations.

At the smaller Lend smelter, indigenous scrap was augmented with imported ingots, depending on the particular requirements of the finished products. The facility consisted of a 15,000-t/yr smelter, two casthouses, a crucible furnace, three oil-fired furnaces, and a closed furnace. Fuel and compressed air tanks were the main products.

The secondary copper smelter at Brixlegg relied on copper and copper alloy scrap from domestic sources, as well as scrap imports from Germany and Italy.

The Erzberg Mine produced a beneficiated iron ore that was shipped by rail to the nearby Donawitz and Linz steel mills of Voest-Alpine Stahl AG for the production ofself-fluxing sinter averaging 50% iron and 3% manganese.

Voest-Alpine Stahl AG reported that the period from April 1997 to September 1997 saw the completion and startup phases of a range of major investments from the special 1996-1998 investment program, particularly at the Linz plant. This included startup of a new CC5 continuous caster and raising the capacity of the Hot Dip Coating Plant No. 2 from 240,000 to 280,000 metric tons. Startup of the 600,000-t/yr continuous annealing facility was expected in the 1st quarter of 1998. At the Donawitz plant the new oxygen plant became operational in 1997 (Voest-Alpine Stahl AG, 1997, Investments—important startup steps completed, accessed May 28, 1998, at URL http://www.voest.co.at/latest/ halbjahr/investi/htm/invest_t.htm).

The Donawitz steel plant was equipped with three blast furnaces (2 million ton-per-year (Mt/yr) total capacity) three basic oxygen converters (1.2 Mt/yr total capacity) and two continuous casting machines. The Linz steel plant had five blast furnaces (2.99-Mt/yr total capacity), three basic oxygen converters (3.35-Mt/yr total capacity), two continuous casting machines, and several rolling mills.

Voest-Alpine was planning to replace the old existing Donawitz steel plant with a clearly structured compact mill in line with state-of-the-art technology. A wider product range could be offered by using fewer aggregates, thus making operations more compact and adaptable. Moreover, material flow would be optimized with regard to logistics and energy consumption. Production capacity would remain unchanged (Voest-Alpine Stahl AG, 1998, Compact steel mill for Donawitz gets the go-ahead, accessed May 28, 1998, at URL http://www.voest.co.at/latest/konznews/htm/pm27398s. htm).

Ample supplies of calcite, dolomite, and limestone were available to support a viable cement industry. Perlmooser Zementwerke AG (PZ), with four plants, was the largest company in 1997. PZ's largest plant, at Mannesdorf near Vienna, had a 1.4-Mt/yr capacity, accounting for about 65% per year of the a domestic cement production.

Austria was one of the world's largest sources of high-grade graphite. Grafitbergbau Kaiserberg AG operated open pit mines at Kaiserberg and at Trieben. Grafitbergbau's 30,000-t/yr capacity processing plant at Kaiserberg consisted of drying, classification, milling, flotation, and fine grinding sections. The other company involved in graphite production was Industrie und Bergbaugesellschaft, Pryssok & Co. KG, which operated the Trandorf open pit mine at Mühldorf.

Veitsch-Radex AG (VRAG) was the largest producer of magnesite in Austria. Three of its five mines were active in 1997. With an output of about 400,000 t/yr, Breitenau was VRAG's largest operation. Radentheim, the smallest with an output of 80,000 t/yr, produced a high iron magnesite. VRAG's dead burned magnesia capacity was very large, exceeding 400,000 t/yr. The iron and steel industry was the largest consumer of VRAG's products (AEIOU, November 27, 1996, Veitsch-Radex AG, accessed July 14, 1998, at URL http://www.aeiou.at/aeiou.encyclop.v/v093189.htm).

Austrian salt mines were owned by the Government and regulated by the Ministry of Finance. All salt output was from three underground mines and one brine well in central Austria. The Government was proceeding with plans to privatize the operations.

Luzenac Naintsch, the only producer of talc in Austria, operated three mines in the Styria region and produced a range of talc, chlorotic talc, dolomite talc, and chlorite-mica-quartz ores. The Rabenwald open-pit mine was the largest, with a capacity of about 100,000 t/yr of talc and chlorotic talc. The Lassing underground mine had a capacity of 30,000 t/yr, producing a dolomite-talc product with a high degree of whiteness. The Weisskirchen underground mine had a capacity of 30,000 t/yr and produced an ore containing chlorite, muscovite mica, and quartz (Naintsch Mineralwerke GmbH, 1997, [Untitled] accessed July 14, 1998, at URL http://www.techplace.at/info/11067.htm).

In the coal mining sector, the open pit Oberdorf Mine of Graz-Koflacher Eisenbahn und Bergbaugesellschaft GmbH was the only lignite mine with any significant production in 1997. The production of about 1 million metric tons was used by a local Ampflwang Mine, was negligible. Additional coal for other thermal power stations was imported from Australia and Poland.

Because Austria is a landlocked country, all transportation is on railroads and highways. The total length of railroad consisted of 5,624 kilometers (km) of standard-gauge and 355 km of narrow-gauge tracks. About 98% of the railroad was Government-owned, and more than 50% was electrified. The length of roads totaled 110,000 km, of which 35,000 km were primary highways, including 1,554 km of autobahn, the rest were mostly gravel and earth. The main navigable river was the Danube, with major ports in Linz and Vienna.

Because of Austria's long history of minerals exploration and mining tradition, geologic conditions are fairly well known. Future mining activities will most likely be concentrated in industrial minerals, mainly for domestic consumption. The chances of finding new and workable base metal deposits are probably remote.

Major Source of Information

Bundesministerium für Wirtschaftliche Angelegenheiten
Lansatrasse Haupstrasse 55-57
1031 Vienna, Austria

TABLE 1
AUSTRIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
METALS						
Aluminum metal, secondary		43,300	52,500	46,800	51,400 r/	52,000
Copper:						
Smelter, secondary		46,856	49,562	53,400 e/	69,000 r/	66,000
Refined:						
Primary		5,871	2,904	530	1,000 e/	2,000
Secondary		46,856	49,562	53,000	57,000 e/	74,000
Total		52,727	52,466	53,530	58,000 e/	76,000
Gold, metal	kilograms	315	382	100 e/	100 e/	100
Iron and steel:						
Iron ore and concentrate:						
Gross weight	thousand tons	1,427	1,653	2,116	1,853	1,800
Fe content	do.	448	390	709	504	500
Metal:						
Pig iron	do.	3,070	3,362	3,838	3,416	3,965 2/
Ferroalloys, electric-furnace e/	do.	12	12	12 r/	11 r/	11
Crude steel	do.	4,149	4,405	4,537	4,442	5,196 2/
Semimanufactures	do.	3,450	3,500	3,968	3,560 r/	4,078 2/
Lead:						
Mine output, Pb content of concentrate		1,340 r/	--	--	--	--
Metal:						
Smelter:						
Primary e/		2,000	--	--	--	--
Secondary		18,800	15,833	21,919 r/	22,000 r/ e/	22,000
Total		20,800	15,833	21,919 r/	22,000 r/ e/	22,000
Refined:						
Primary		4,779	418	--	--	
Secondary		17,857	17,165	21,919	22,900 r/	22,700
Total		22,636	17,583	21,919	22,900 r/	22,700
Manganese, Mn content of domestic iron ore		26,890	31,288	42,463	26,000 e/	25,000
Silver, metal		--	24	--	--	
Tungsten, mine output, W content of concentrate		105 r/	--	738 r/	1,413 r/	1,400
Zinc:						
Mine output, Zn content of concentrate		20,014 e/	--	--	--	--
Metal, primary, refined		6,838	--	--	--	--
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand tons	4,941	4,828	3,843	3,873 r/	3,852 2/
Clays:						
Ilite	do.	300	267	277	151	150
Kaolin:						
Crude	do.	342	469	427	180 r/	180
Marketable	do.	64	65	57 r/	60 r/	60
Other	do.	2,990	2,981	2,900 e/	3,000	2,800
Feldspar, crude		8,492	4,883	--	--	--
Graphite, crude		4,146	12,324	12,019	12,000 r/	12,000
Gypsum and anhydrite, crude	thousand tons	876	1,070	958 r/	996	1,000
Lime	do.	1,811 r/	1,850 r/	1,908 r/	1,990 r/	2,000
Magnesite:						
Crude	do.	649	681	784	624	700
Sintered or dead-burned	do.	323	297	272	289	300
Caustic calcined	do.	50	76	59	52	60
Nitrogen, N content of ammonia e/		400	400	400	400	400
Pigments, mineral, micaceous iron oxide e/		8,400 2/	8,000	8,000	7,500	7,500
Pumice (trass)		9,102	5,670	6,000 e/	6,000	5,000
Salt:						
Rock	thousand tons	1	1	1	1	1
In brine	do.	695	701	523	367 r/	400

See footnotes at end of table

TABLE 1--Continued
AUSTRIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
INDUSTRIAL MINERALS--Continued						
Sand and gravel:						
Quartz sand	thousand tons	4,300	6,457	7,503	6,012	6,000
Other sand and gravel	do.	16,942	19,067	16,048	16,000	18,000
Total	do.	21,242	25,524	23,551	22,012	24,000
Sodium compounds, n.e.s.: e/						
Soda ash, manufactured	do.	150	150	200	200	200
Sulfate, manufactured	do.	120	120	100	100	100
Stone: 3/						
Dolomite	do.	7,770	8,159	8,790	9,155	9,000
Quartz and quartzite	do.	429	416	395	317 r/	282 2/
Other:						
Limestone and marble	do.	19,600	19,993	19,080	20,000	20,000
Basalt	do.	3,360	4,092	4,202	698 r/	647 2/
Marl	do.	2,840	2,306	1,931	2,000	2,000
Crushed stone	do.	11,500	11,937	11,299	12,000	12,000
Total	do.	45,499	46,903	45,697	44,170 r/	43,929
Sulfur, byproduct:						
Of metallurgy e/		9,296 2/	6,500	1,500	--	--
Of petroleum and natural gas		7,656 2/	9,266	9,000 e/	10,000 e/	9,000
Total		16,952 2/	15,766	10,500	10,000	9,000
Talc and soapstone, crude		136,640	130,602	131,614	130,000	155,730 2/
MINERAL FUELS AND RELATED MATERIALS						
Coal, brown and lignite	thousand tons	1,691	1,368	1,282	1,110	1,100
Coke	do.	1,400	1,328	1,330	1,350 e/	1,300
Gas, natural:						
Gross	million cubic meters	1,488	1,489	1,480	1,400 e/	1,400
Marketed e/	do.	1,100	1,000	1,000	1,000 e/	100
Oil shale		195	1,146	1,078	498	500
Petroleum:						
Crude	thousand 42-gallon barre	8,060	7,671	7,213	7,121 r/	7,200
Refinery products:						
Liquefied petroleum gas	do.	6,760	4,292	6,960	7,000	7,000
Gasoline	do.	19,000 e/	21,598	17,680	19,541 r/	20,120 2/
Kerosene and jet fuel	do.	3,140	2,929	3,309	3,823 r/	3,960 2/
Distillate fuel oil	do.	12,800	9,064	8,736	9,000	9,000
Lubricants	do.	8,670	280 e/	--	--	--
Residual fuel oil e/	do.	11,000	11,000	11,000	9,510 2/	9,623 2/
Bitumen e/	do.	1,660 2/	1,500	1,500	1,500	1,600
Unspecified	do.	739	628	630	600	600
Refinery fuel and losses	do.	2,240	2,102	2,310	2,200	2,000
Total e/	do.	66,009	53,393	52,125	53,174 r/	53,903

e/ Estimated. r/ Revised.

1/ Table includes data available through May 1998.

2/ Reported figure.

3/ Excluding stone used by the cement and iron and steel industries.

TABLE 2
AUSTRIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	Salzburger Aluminum GmbH	Smelter at Lend	15
Do	Austria Metall AG (Government, 100%)	Smelter at Ranshofen	50
Cement	Perlmooser Zementwerke AG	Plants at Kirchblich, Mannesdorf, Retsnei, and Rodaun	3,000
Do	Gebr Leube Portlandzementwerke	Plant at Gartenau	700
Do	Zemenwerke Eiberg	Plant at Eiberg	600
Do	Wietersdorfer Zemenwerke	Plant at Wietersdorf	600
Coal	Graz-Koflacher Eisenbahn und Bergbaugesellschaft GmbH (Government, 100%)	Oberdorf Mine	1,200
Copper	Austria Metall AG (Metal Mining Corp. of Canada, 41%, Mount Isa Mines of Australia, 41%, and Government, 18%)	Plant at Brixlegg	75
Graphite	Industrie und Bergbaugesellschaft Pryssok & Co KG	Trandorf Mine at Muhldorf	15
Do	Grafitbergbau Kaiserberg AG	Kaisersberg Mine	3
Do	Grafitbergbau Trieben GmbH	Trieben Mine	3
Gypsum	Erste Salzburger Gipswerk-Gesellschaft Christian Moldan AG	Abtenau and Moosegg Mines	300
Do	Rigips Austria GmbH	Grundlsee, Puchberg, Unterkainisch, and Weisenbach Mines	250
Do	Knauf Gesellschaft GmbH	Hinterstein Mine	160
Iron ore	Voest-Alpine Erzberg GmbH (Government, 100%)	Erzberg Mine at Eisenerz	2,000
Lead	Bleiberg Bergwerks-Union AG (Metall Gesellschaft, 74%)	Smelter at Brixlegg	55
Magnesite	Veitsch - Radex AG	Mines at Breitenau, Hochfilzen and Radenthein	600
Do	Radex Austria AG (Osterreichische Magnesit AG, 100%)	Millstatteralpe Mine	250
Natural gas million cubic meters	Osterreichische Mineralolverwaltung AG (Government, 100%)	Fields in Vienna Basin	1,500
Steel	Voest-Alpine Stahl AG (Government, 100%)	Plants at Donawitz and Linz	4500
Talc	Luzenac Naintsch AG	Mines at Lassing, Rabenwald, and Weisskirchen Plants at Oberfeistitz and Weisskirchen	160
Tungsten	Wolfram Bergbau und Hütten GmbH	Mittersill Mine, Salzburg; conversion plant, Bergla	350

THE MINERAL INDUSTRY OF

AZERBAIJAN

By Richard M. Levine

For over one century, Azerbaijan has been an oil and gas producer and has had a petroleum refining industry. It is also a producer of iron ore, alunite, alumina and aluminum, copper and molybdenum ore, lead and zinc ore, and industrial minerals, including iodine and bromine, clays, gypsum, limestone, marble, decorative building stone, sand and gravel, and precious and semiprecious stones.

The country's most significant reserves in terms of value are its oil reserves; a number of foreign firms are involved in projects to develop these reserves. Azerbaijan also has numerous other mineral resources, including metals, such as aluminum in alunite, arsenic, chromite, cobalt, copper, iron ore, lead and zinc, manganese, mercury, molybdenum, and tungsten; industrial minerals, such as barite, clays, refractory-grade dolomite, gypsum, kaolin, limestone, pyrite, salt, and zeolites, and semiprecious stones, including amethyst, andalusite, and garnet, as well as a range of building materials.

The country has 350 nonfuel mineral deposits with resources that are termed "explored" on the basis of the reserve classification system used in the former Soviet Union (FSU): 168 of these deposits were being developed. At the conference in Istanbul on June 16 to 18, 1998, entitled "Central Asia, Balkans and Caucasus Countries: Mining, Investment, and Business Opportunities Symposium" sponsored by the Multilateral Investment Guarantee Agency, the Organization for Economic Cooperation and Development, and the Turkish International Cooperation Agency, the Chairman of the Azerbaijan State Committee for Geology and Mineral Resources listed major undeveloped and developed deposits with explored resources for which the country was seeking to attract foreign investors to develop undeveloped deposits and to expand operations at developed deposits.

These proposed investment opportunities included developing the Filizchaisky group of deposits, which contains copper, lead, zinc, and byproducts, including gold and silver; establishing an enterprise to process cobalt-bearing magnetite ores and to extract cobalt from tailings from the Dashkesansky group of deposits; producing iron ore pellets from reserves of magnetite ores in the Dashkesansky group of deposits; constructing a plant to produce bentonite powder for ferrous metallurgy from reserves at the Dashsalakhlynsky deposit; developing the Karadagsk copper porphyry deposit and establishing a company to produce copper and blue vitrol; establishing a joint venture to mine copper-bearing pyritic ores from the Mazymchaisky deposit; establishing a glass production plant using raw material from the Negramsky dolomite deposit; establishing a plant to produce soda ash using reserves of dolomite and rock salt from the Nakhichevan autonomous district; establishing a joint venture to develop the Aidagsky zeolite deposit; constructing a plant to treat bromine-iodine waters to produce finished products; developing a company to produce tiles from decorative stones; and establishing a joint venture to produce items using precious and semiprecious stones (Shekinsky, 1998).

In 1997, for the second consecutive year, Azerbaijan reported an increase in gross domestic product (GDP), which increased by 5.8% compared with that of 1996. Industrial output increased by 0.3%. Still, GDP in 1997 was only 45% of that in 1991, and industrial output was only 36%. Unrecorded economic activity had been estimated to account for about 25% of the country's economic activity, making any published GDP figures uncertain (Interfax Statistical Report, 1998b). In 1997, Azerbaijan's chief export was mineral products, which composed more than 60% of the total value of exports (Interfax Statistical Report, 1998a). The country traditionally exported only refinery products, and in 1997, only minimal exports of crude oil were reported by any of the international consortia of which the State Oil Company of Azerbaijan (Socar) is a member.

Reported production figures for 1997 show increases and decreases in nonfuel minerals production compared with those of 1996 and a slight decrease in mineral fuel production. *(See table 1.)* According to the president of the Metallurgiya holding company, the metals industry employed about 10,000 people but was working at just 10% to 15% of capacity. The president of Metallurgiya also stated that the industry was badly in need of foreign investment, particularly in the aluminum production sector.

Azerbaijan produced alumina from bauxite and domestic alunite ore mined from open pits. About 6 metric tons (t) of alunite ore is normally required to produce 1 t of alumina. Alunite processing, which is very energy-intensive compared with bauxite processing, was started under the former Soviet system that made mineral production a priority irrespective of production costs. Nevertheless, the 450,000-metric-ton-per-year (t/yr) capacity Gyandzha alumina refinery, originally built to process alunite, was expanded in the late 1970's to process imported bauxite rather than alunite. Only one section at Gyandzha, with a capacity to produce 100,000 t/yr of alumina, processed alunite. The alumina from Gyandzha was shipped to the Sumgait aluminum smelter in Azerbaijan and the Tajik aluminum smelter in Tajikistan. The Sumgait smelter had the capacity to produce about 60,000 t/yr of aluminum. According to the president of Metallurgiya, the revival of the aluminum industry would require full integration of processes from the mining of alunite through the smelting of aluminum (Interfax Mining and Metals Report, 1998b).

Azerbaijan did not begin a program of rapid privatization until mid-1996, and the privatization of medium- and large-scale enterprises did not begin until mid-1997. A large number of enterprises in the mineral sector, including those producing cement, petrochemicals, and oil and gas, were classified as strategic enterprises and could be privatized only by a presidential decree (United States-Azerbaijan Chamber of Commerce, 1998, p. 27).

Such a decree was issued in early 1998 to privatize the metallurgical enterprises that formed the Metallurgiya holding company. These enterprises included the Azerboru association (formerly the Sumgait steel pipe plant); the Sumgait nonferrous metals plant, Sumgaittsvetmet; the Gyandzha Glinozem (alumina) production association; and the Zaglik alunite mines. The enterprises will be tendered, and foreign investors will be allowed to bid. In a separate clause, the contract that allowed the Trans World Corp. (TWC) to manage the Glinozem enterprise was repealed. The management contract for Glinozem was actually dissolved at the start of 1998 by TWC, which stated that it had too many problems trying to sell the sulfuric acid obtained as a byproduct from alunite processing (Interfax Mining and Metals Report, 1998b).

Between August 1996, when Gyandzha was signed over to TWC, and December 1997, the plant was in operation only 75 days. Following the termination of the TWC contract, the former management was reinstated. Gyandzha employed 2,800 people and, besides alumina, had the capacity to produce 350,000 t/yr of sulfuric acid and 115,000 t/yr of mineral fertilizers. Production peaked near capacity in 1987-88, but has since fallen to about 20% of capacity (Interfax Mining and Metals Report, 1998a).

Azerbaijan was engaged in an effort to develop its gold resources. The Azerbaijan Geology Department forecast the country's total gold reserves to be 1,500 t, practically none of which has been mined. The Government of Azerbaijan and the RV Investment Group Services LLS, a consortium from the United States, signed a contract for the exploration and development of nine gold lode deposits in the Nakhichevan autonomous district and the Angelan, the Kebadzhar, the Kedabak and the Tauz regions of Azerbaijan. The consortium will finance the exploration and development and retain a 49% interest, and the Azerbaijanian company Azergyzyl will own 51%. During the first 3 years, the project would explore the nine deposits, which are estimated to contain 400 t of gold, 2,500 t of silver, and 15 million metric tons (Mt) of copper ore. These estimates included resources in territories for which there was an ownership dispute with Armenia. The Kelbadzhar and the Zangelan districts were claimed by Armenia and host the Kyazylbulag, the Suitlin (called Zod by the Armenians), and the Vekdzhnelin gold lodes. Armenia already signed a contract with Global Gold of the United Kingdom to develop Zod. Azerbaijan, however, claimed that 73% of this deposit was on Azerbaijanian territory (Interfax Mining and Metals Report, 1997).

Azerbaijan's major industry was oil production. Oil production peaked at about 500,000 barrels per day (bbl/d) during World War II, then fell significantly after the 1950's as the Soviet Union redirected oil development resources elsewhere. Production also declined after Azerbaijan became independent in 1991 and fell slightly in 1997 compared with 1996. Oil production, however, began at the country's first production sharing agreement (PSA) project at Chirag. Plans for 1998 called for oil production to remain at about the 9-Mt level (Interfax Petroleum Report, 1998b).

Azerbaijan's oil production occurred primarily offshore in the Caspian Sea. One field, Guneshli, 60 miles off the Azeri coast, accounted for more than one-half of the country's oil production. All crude oil produced in Azerbaijan was refined at Azerbaijan's two domestic refineries in Baku; only petroleum products had been exported (U.S. Department of Energy, November 1997, Azerbaijan, accessed May 5, 1998, at URL http://www.eia.doe.gov/emeu/cabs/azerbaijan.html).

With the planned development of new oilfields in the Caspian Sea through joint ventures and PSA's, Azerbaijan's oil production should increase to levels far exceeding its former peak production within the next 10 to 15 years. As of 1997, Azerbaijan had signed nine oil development PSA's, and 20 companies from 12 countries were engaged in offshore development. The Azerbaijan signatory to the PSA's was Socar (State Oil Company of the Azerbaijani Republic) (United States-Azerbaijan Chamber of Commerce, 1998, p. 54).

Seven of the foreign companies engaged in offshore development were from the United States (Amoco, Arco, Chevron, Exxon, Mobil, Pennzoil, and Unocal). The nine agreements were as follows: The first project, the Azerbaijan International Operating Company (AIOC), was formed in September 1994, in what was described as "the deal of the century," by an international consortium to develop three fields, the Azeri, the Chirag, and the deep-water portions of Guneshli, with total reserves estimated to be 3 billion to 5 billion barrels. The AIOC included the following companies with their representative stakes: British Petroleum (17.1%); Amoco (17%); Socar (10%); Lukoil (Russia, 10%); Unocal (10%); Statoil (Norway, 8.6%); Exxon (8%); TPAO (Turkey, 6.8%); Pennzoil (4.8%); Itochu (Japan, 4%); Ramco (United Kingdom, 2.1%), and Delta-Nimir (Saudi Arabia, 1.6%) (U.S. Department of Energy, November 1997, Azerbaijan, accessed May 5, 1998, at URL http://www.eia.doe.gov/ emeu/cabs/azerbaijan.html).

Initial oil production from the AIOC project, termed "early oil", would be produced from an existing platform at the Chirag field and was projected to reach between 80,000 and 100,000 bbl/d by yearend 1997. The AIOC planned to export this early oil via two pipelines—a northern route through Russia and a western route through Georgia. Each line will have an initial capacity of 100,000 bbl/d and will have the ability to at least double that capacity with additional pumping facilities. The northern route uses an existing pipeline through Chechnya to the Russian Black Sea port of Novorossisk. This northern pipeline began pumping its first flow on November 12, 1997, when the President of Azerbaijan opened the valve on the Chirag-1 platform in the Caspian Sea. The main flows of oil, however, will not begin for another 7 years (Interfax Petroleum Report, 1997c).

In 1997, two AIOC project wells drilled from the Chirag-1 platform at the Chirag field went into production with the second coming on-stream in December. In 1998, a total of six wells are to be drilled from Chirag-1, which will increase extraction, as well as shipments through Russia, by the end of 1998 (Interfax Petroleum Report, 1997d).

The western route, scheduled for completion by yearend 1998, will require constructing a new pipeline from Baku to Georgia, upgrading and refurbishing an existing pipeline from near Tbilisi to the Black Sea coast, and building a new oil terminal at Supsa in Georgia. Reporting in April 1998 indicates that the pipeline route to Supsa will not be completed in 1998 (Interfax Petroleum Report, 1998c).

The AIOC expected production to peak at about 800,000 bbl/d within the next 15 years. This will require the building of a main export pipeline with a capacity of 1 million barrels per day. Several options for routes were under consideration by the Azerbaijan Government in 1997, including pipelines from Baku to Ceyhan (Turkey), Baku to Supsa, and Baku to Novorosiisk. A final decision was not expected until mid-1999 (U.S. Department of Energy, November 1997, Azerbaijan, accessed May 5, 1998, at URL http://www.eia.doe.gov/emeu/cabs/azerbaijan.html).

The second project, signed in November 1995, was the Caspian International Operating Company (CIOC) to develop the 900-million-barrel Karabakh field. CIOC stakeholders included: the Lukoil/Agip joint venture LukAgip (50%), Pennzoil (30%), Lukoil (7.5%), Socar (7.5%), and Agip (5%) (U.S. Department of Energy, November 1997, Azerbaijan, accessed May 5, 1998, at URL http://www.eia.doe.gov/emeu/cabs/azerbaijan.html).

The third project, signed in December 1996, was the Shak-Deniz project, which has 700 million barrels of oil, as well as large gas resources. Consortium members included British Petroleum (25.5%), Statoil (25.5%), Lukoil (10%), Elf Aquitaine (France, 10%), Socar (10%), the National Iranian Oil Company (10%), and TPAO (9%). U.S. firms were absent because of Iranian participation (U.S. Department of Energy, November 1997, Azerbaijan, accessed May 5, 1998, at URL http://www.eia.doe.gov/emeu/cabs/azerbaijan.html).

The fourth project, also signed in December 1996, was the North Aspheron Operating Company venture. The consortium was granted the right to explore a block containing the Ashrafi and the Dan Ulduzu oilfields. Consortum members were Amoco (30%), Unocal (25.5%), Itochu (20%), Socar (20%), and Delta (Saudi Arabia, 4.5%) (U.S. Department of Energy, November 1997, [Azerbaijan], accessed May 5, 1998, at URL http://www.eia.doe.gov/emeu/cabs/azerbaijan.html).

The fifth project, signed in January 1997, was for development of the Lenkoran-Deniz and the Talysh-Deniz fields. Stakeholders were Elf Aquitaine (40%), Socar (25%), Total (France, 10%), OIEC (Iran, 10%), Deminex (Germany, 10%), and Petrofina (Belgium, 5%) (U.S. Department of Energy, November 1997, Azerbaijan, accessed May 5, 1998, at URL http://www.eia.doe.gov/emeu/cabs/azerbaijan.html).

In August, the President of Azerbaijan visited the United States and signed three agreements, bringing the total to eight agreements. Agreements were signed for the South Aspheron field with Chevron (30%), Total (20%), and Socar (50%); for the Nakhichevan field with Exxon (50%) and Socar (50%); and for the Aegis field with Mobil (50%) and Socar (50%). Negotiations are continued for other fields (United States-Azerbaijan Chamber of Commerce, 1998, p.54-55).

In July, the Azerbaijan Parliament ratified a ninth PSA between Lukoil (60%) and Socar (40%) for exploration and development of the D-222 block in the Caspian with an exploration period set for 4 years with two wells to be drilled and provisions for a 2-year extension of the period with two more wells to be drilled (Interfax Petroleum Report, 1997b).

In February 1998, the Atlantic Richfield Company of the United States joined the project to develop D-222 as Lukoil officially transferred its 60% stake to Lukarco, a joint venture set up by the two companies (Interfax Petroleum Report, 1998a). Also, Agip won a 25% interest in a tender to explore and develop the Kyurdashi block in the Azerbaijanian sector of the Caspian Sea. Socar will retain a 50% stake, and the remaining 25% stake was as yet unassigned (Interfax Petroleum Report, 1997a).

A potential complication in Azerbaijan's plans for developing its Caspian Sea resources was the uncertainty regarding the legal status of the territorial rights of nations bordering its shores (Iran, Kazakhstan, Russia, and Turkmenistan. A debate took place among Caspian region states over how the Caspian Sea should be treated under international law. Hydrocarbon development has been slowed by legal questions that concern whether development rights are to be governed by treaties signed between the former Soviet Union and Iran that did not establish seabed boundaries or discuss oil and gas exploration and whether the Caspian is a body of water affected by the Law of the Sea. Generally, inland lakes are not covered by this law. If the Law of the Sea convention were applied to the Caspian Sea, then full maritime boundaries of the five littoral states bordering it would be established on the basis of the equidistant division of the sea and its undersea resources into national sectors. If the Law were not applied, then the Caspian and its resources could be developed jointly by the littoral states (U.S. Department of Energy, November 1997, Azerbaijan, accessed May 5, 1998, at URL http://www.eia.doe.gov/emeu/cabs/azerbaijan.html).

Russia took the position that neither the Law of the Sea nor its precedents apply because the Caspian is an enclosed sea. In December 1996, Russia had called for joint navigation rights, joint management of fisheries and environmental protection, the establishment of an interstate committee of all boundary states to license exploration in a joint-use zone in the center of the Caspian beyond a 45-nautical-mile exclusive national zone, and joint cooperation of these states to exploit these resources. Iran agreed with Russia's position that the regional treaties signed in 1921 and 1940 were valid, implying that all Caspian littoral states must approve any offshore oil developments (U.S. Department of Energy, November 1997, Azerbaijan, accessed May 5, 1998, at URL http://www.eia.doe.gov/emeu/cabs/azerbaijan.html).

Azerbaijan rejected this view, claiming that official boundaries within the Caspian for the FSU had been formalized under the Soviet Union. Azerbaijan also called for the Law of the Sea to be applied and advocated the establishment of maritime boundaries for national sectors on the basis of the equidistant division of the sea. Boundaries thus would follow those that had been established and recognized under the Soviet Union to delineate sectors for oil exploration and development for the former republics.

Kazakhstan supported Azerbaijan's position regarding the establishment of national sectors. Turkmenistan, whose position has been evolving, initially supported Russia's proposal for the 45- nautical-mile zone for each littoral state proposed at a November 1996 meeting in Ashgabat of the foreign ministers from the five littoral states. It claimed control of oil-fields beyond the 45-mile zone in what Turkmenistan considers to be its territorial waters, according to the division of the Caspian among the littoral states. The change in Turkmenistan's position arose in the context of a dispute with Azerbaijan over a field called Kyapaz by Azerbaijan and Serdar by Turkmenistan. In July, Azerbaijan reached a preliminary agreement to develop this field, but in September, Turkmenistan laid claim to it by including it as part of its Block 30 licensing. The dispute with Turkmenistan revolved around where to draw the median boundary line in the Caspain to delineate Azerbaijan's territory from that of Turkmenistan (U.S. Department of Energy, November 1997, Azerbaijan, accessed May 5, 1998, at URL http://www.eia.doe.gov/emeu/cabs/azerbaijan.html).

Russia's position on the Caspian Sea also seemed to be evolving. In July 1998, the Presidents of Russia and Kazakhstan signed an agreement dividing the northern part of the Caspian seabed into separate national sectors. For the first time, Russia recognized a bordering state's claim to offshore oil resources; this could be a harbinger of a resolution to the issue of the ownership of offshore seabed resources in the Caspian. Russia, however, did not relinquish its rights regarding use of the Caspian Sea, including the laying of pipelines (Financial Times, 1998).

Natural gas production also decreased in 1997 by more than 5% compared with that of 1996. In 1998, gas production is expected to rise slightly to 6.19 billion cubic meters (Interfax Petroleum Report, 1998b). In the past, Azerbaijan had imported natural gas from Russia, Turkmenistan, and Iran to meet its domestic demand. To reduce and eliminate eventually the need to import gas, Azerbaijan planned to develop new gasfields in the Caspian Sea that could make Azerbaijan self-sufficient in gas within 5 years. Increased oil production in the Caspian was also expected to increase gas production as most of Azerbaijan's natural gas production now comes from associated gas from offshore oilfields. Additional gas production could also come from the recently discovered offshore Nakhichevan field, with its estimated 900 billion cubic feet of natural gas reserves. Azerbaijan was also boosting natural gas production by reducing flaring and using existing casing head gas. As a result, gas production could increase by as much as 1 trillion cubic feet per year by the end of the next decade, and Azerbaijan could become a net exporter of natural gas to its neighbors (U.S. Department of Energy, November 1997, Azerbaijan, accessed May 5, 1998, at URL http://www.eia.doe.gov/emeu/cabs/azerbaijan.html).

Azerbaijan's oil and gas production sector has great economic potential. By 2010, total investment in the oil and gas sector may be $23 billion (U.S. Department of Commerce, 1998 Country Commercial Guide for Azerbaijan, accessed April 6, 1998, at URL http://www.itaiep.doc.gov/bisnis/bisnis.html). Azerbaijan signed nine PSA's that provide a solid investment foundation for the oil sector of the economy. Although no official estimates exist for the country's total reserves, industry experts suggested that Caspian reserves could approach those of the North Sea, and virtually every major oil company in the world has taken an active interest in Azerbaijan. It appears that reserves may not be as large as initially anticipated, and there could be a reevaluation of pipeline routes and other development activities. The country also was concerned that it not rely solely on oil development, but instead achieve balanced development, and for that reason, was making efforts to revive its other industries, including its mining and metallurgical industries.

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TABLE 1
REPORTED MINERAL PRODUCTION FOR AZERBAIJAN

(Metric tons)

Commodity		1996	1997
Aluminum		812	4,717
Caustic soda		33,000	23,000
Cement		223,000	314,700
Fertilizers		1,900	5,400
Natural gas	thousand cubic meters	6,304,000	5,963,900
Petroleum, crude		9,100,300	9,027,000
Steel, crude		2,725	24,607
Rolled		2,000	16,400
Pipes		3,100	13,000
Sulfuric acid		31,000	52,500

Source: United States-Azerbaijan Chamber of Commerce, Investment Guide to Azerbaijan, 1998, p.71; Interfax Statistical Report, v. VII, issue 13, March 20-27, 1998, p. 10; Interfax Statistical Report, v. VI, issue 8, February 14-21, 1997, p. 13-16.

TABLE 2
AZERBAIJAN: STRUCTURE OF THE NONFUEL MINERAL INDUSTRY IN 1997 1/

(Metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity e/
Aluminum	Sumgait smelter	Sumgait	50,000.
Alumina	Gyandzha refinery	Ganca (formely Gyandzha)	450,000.
Alunite ore	Zaglik alunite mining directorate	Zaylik (formerly Zaglik)	600,000.
Cement	Karadag cement plant	Karadag	1,000,000 (total for both plants).
Do.	Tauz cement plant	Tovuz (formerly Tauz)	
Iodine and bromine	Baku, Karadag, Neftechala plants	Process oil well brines at plants in Baku, Karadag, and Neftechala	30,000 bromine, 100 iodine.
Iron ore, marketable	Dashkesan Mining Directorate	Dashkesan region	1,000,000.
Steel, pipes	Azerbaijan tube and pipe works (Azerboru)	Sumgait	800,000 (crude steel). 700,000 (rolled steel). 540,000 (pipe, tubes).

e/ Estimated.

1/ For the structure of the fuel industry, please refer to the text in which the new developments and restructuring of the oil and gas sector are discussed.

THE MINERAL INDUSTRY OF

BELARUS

By Richard M. Levine

In 1997, mining accounted for 5.2% of industrial production in Belarus (Ministerstvo statistiki I analiza Belarus, 1998) and consisted primarily of extracting potash from the Starobinsk deposit, peat at deposits throughout the country, some oil and natural gas, and some construction materials. In the mineral commodity production sector, Belarus produced steel at one minimill in Zhlobin and steel pipe at a plant in Mohilyov (formerly Mogilev). The country also had a large diamond cutting and synthetic diamond production industry, a nitrogen production enterprise, a fertilizer production plant, and a large petroleum refining sector with refineries at Mazyr and Navapolatsk with a combined capacity to produce 40 million metric tons per year (Mt/yr) of petroleum products. Owing to its lack of domestic resources, Belarus imported most of its mineral raw materials, most of which came from Russia and other Commonwealth of Independent States (CIS) countries. Based on Belarus trade data (see table 3), Belarus appeared to be a transshipper of mineral commodities to the CIS and the rest of the world.

In 1997, Belarus reported that its gross domestic product increased by 10% and industrial output increased by 17.6% compared with that of 1996 (Interfax Statistical Report, 1998). In the minerals sector, production increased for cement, ferrous metals, nitrogen, and potash, and production remained at about the same level or decreased slightly for natural gas and crude oil.

Belarus was one of the world's largest producers of potash. In the 1980's, Belarus was producing more than 5 Mt/y calculated on the basis of potassium oxide (K_2O) content, but following the breakup of the Soviet Union, production had fallen to about 1.9 million metric tons (Mt) of K_2O by 1993. In an effort to increase exports to world markets, a program to raise the quality of potash to world standards was then undertaken. In 1997, production had increased to more than 3.2 Mt K_2O produced from 23.4 Mt of mined ore. Potash was mined by the Belaruskaliy Production Association, which operated the Soligorsk mining complex located in Minsk oblast; in 1997, Belaruskaliy reported profits of 2 trillion rubles, or approximately $65 million [30,740 Belarus rubles per $1 at the beginning of 1998] (Kalugin, 1998).

In 1997, Belarus shipped more than 3 Mt of potash calculated on the basis of K_2O to consumers, which was a 25% increase compared with that of 1996. Of total shipments, 23.8% went to consumers in the CIS, and 76.2% was exported outside the CIS. Belarus itself was the largest consumer of its potash in the CIS, consuming 450,000 metric tons (t), followed by Russia, which consumed 300,000 t. Although prior to the breakup of the Soviet Union, almost all of Belarus' potash was exported to the Commonwealth of Mutual Economic Assistance (CMEA) countries in East Europe, in 1997, this region only received about 25% of Belarus' potash exports. Ukraine, which, up until 1992 had been receiving more than 1 Mt/yr of potash from Belarus, in 1997 received only about 40,000 t in. In 1997, among the largest importers of Belarus potash were China, Malaysia, Poland, and the United States (Kalugin, 1998).

In 1997, Belarus refined 11.9 Mt of crude oil, which was 4% less than that of 1996. Of the country's two refineries, the Nafatan refinery in Navapolatsk refined 7.3 Mt, which was 5.6% more than that of 1996, and the Mazyr refinery in Mazyr refined 4.6 Mt, which was 16.3% less than that of 1996. The decline in refinery output was caused by shortfalls in crude oil deliveries from Russia (Interfax Petroleum Report, 1998). Russian companies owned a large portion of the Belarus refineries. Belarus was also a large transshipper of Russian oil along the Belarus portion of the Druzhba pipeline.

The Belarus electric steelworks, a minimill in Zhlobin that produced metal cord and rolled products, was the country's main producer of ferrous metals. Its feedstock was scrap imported from Russia. In 1997, the plant produced 1.11 Mt of crude steel, which was an increase of 39.8% compared with that of 1996. It shipped 697,000 t of rolled steel, which was 25% more than that of 1996, and 40,300 t of metal cord, which was 11.8% more than that of 1996 (Interfax Mining and Metals Report, 1998a).

In 1997, the Mohilyov metallurgical works, Belarus' iron and steel pipe producer produced 22,684 t of iron pipe and 28,686 t of steel pipe, which was respectively 44.8% and 68.8% more than that produced in 1996. Boston Trade Connections of the United States owned 38.8% of the Works (Interfax Mining and Metals Report, 1998b).

For more extensive coverage of the mineral industry of Belarus, see the 1996 Minerals Yearbook, Volume III, International Review of Europe and Central Eurasia.

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Major Sources of Information

Ministry of Statistics and Analysis
220070, Minsk
Prospekt Partizanskiy, 12
Belarus
Telephone: 172-49-52-00
Fax: 172-49-22-04
Ministry of Energy
220677, Minsk
Ul. Karla Marksa, 14
Belarus
Fax: 172-298-468
Ministry for Foreign Economic Relations
Minsk, 220010
House of Government
Sovetskaya Ul. 10
Belarus
Fax: 172-296-335
Ministry of Natural Resources & Environmental Protection
220855, Minsk
Ul. Kazintsa, 4
Belarus
Fax: 172-260-084
Ministry of Industry
220033, Minsk
Partizansky Prospekt 2/4
Belarus
Telephone: 172-20 61 37
Fax: 172-27 39 24
State Committee on Customs
220029, Minsk
Kommunisticheskaya ul, 11
Belarus
Telephone: 172-33 23 16
Fax: 172-34 68 93
State Committee on Energy
220084, Minsk
Ul. Karla Marksa 14
Belarus
Fax: 172-229-8355

TABLE 1
BELARUS: PRODUCTION OF MINERAL COMMODITIES 1/

(Thousand metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997
Cement		1,900	1,500	1,235	1,467	1,876 r/
Nitrogen, N content of ammonia		600 r/	550	670	680	590
Peat (fuel use)		2,922	3,482	3,145	2,793	2,768 r/
Petroleum:						
Crude		2,000	2,000	1,932	1,860	1,822 r/
Refined		14,200	12,700	13,100	12,400 r/	11,900
Potash, K2O content		1,900	3,000	3,200	2,700 e/	3,247
Steel:						
Crude		947	880	744	886	1,220 r/
Pipe		44	10	12	19	31
Rolled		600	700	586	800	1,100
Natural gas	million cubic meters	300	295	266	249	246 r/
Sulfuric acid		399	291	437	549	698

e/ Estimated. r/ Revised.

1/ Table includes data and estimates based on information available through March 6, 1999.

TABLE 2
BELARUS: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity	Major operating company	Location of main facilities	Annual capacity e/
Cement	Volkovysskiy plant Krichevskiy plant	Wawkavysk (Volkovsky) Mogilev region	2,200, total both plants
Diamonds	Kristall plant	Homel (Gomel)	NA.
Nitrogen, N content of ammonia	Grodno "Azot" Association	Hrodna (Grodno) region	1,000.
Peat, fuel use	Production at 37 enterprises producing mainly briquettes	All regions of country	5,000. 1/
Petroleum, crude	Belarusneft Association	Hrodna region	2,000.
Petroleum, refining	Mazyr refinery Naftan refinery	Mazyr (Mozyr) Navapolatsk (Novopolotsk)	40,000 2/
Potash, K2O content	Belaruskaliy Production Association	Soligorsk area	5,000.
Steel, crude	Belarus electric steelworks	Zhlobin	1,100
Steel, pipes	Mohilyov metallurgical works	Mohilyov	80.

e/ Estimated. NA Not available.

1/ Total peat for fuel use production.

2/ Total for both refineries.

TABLE 3
BELARUS: FOREIGN TRADE

(Metric tons unless otherwise specified)

Commodity	Exports	
	1996	1997
Aluminum, primary:		
To CIS 1/	31,200	438,400
To rest of world	158,700	18,000
Coal, bituminous:		
To CIS	NA	NA
To rest of world	400	200
Coke:		
To CIS	NA	604,700
To rest of world	182,500	NA
Copper, anodes:		
To CIS	NA	0.3
To rest of world	NA	NA
Ferroalloys:		
To CIS	417	27,994
To rest of world	NA	NA
Lead, primary:		
To CIS	NA	3,612
To rest of world	NA	89,700
Pig iron:		
To CIS	141	12,183
To rest of world	18	NA
Petroleum, crude:		
To CIS	NA	20
To rest of world	300,000	400,000

Commodity	Imports	
	1996	1997
Aluminum, primary:		
From CIS	5,905	7,393
From rest of world	NA	NA
Coal, bituminous:		
From CIS	986,100	706,300
From rest of world	8,900	2,100
Coke:		
From CIS	53,867	60,207
From rest of world	NA	NA

Commodity	Exports	
	1996	1997
Copper, anodes:		
From CIS	77	83
From rest of world	NA	NA
Iron ore and concentrate:		
From CIS	NA	1,900
From rest of world	NA	NA
Lead, primary:		
From CIS	3,857	4,146
From rest of world	NA	NA
Nickel:		
From CIS	11	177
From rest of world	NA	NA
Pig iron:		
From CIS	89,261	159,502
From rest of world	NA	NA
Natural gas: million cubic meters		
From CIS	143,345	15,752
From rest of world	NA	NA
Petroleum, crude:		
Fom CIS	10,644,700	10,460,700
From rest of world	NA	100

See footnotes at end of table.

TABLE 3--Continued
BELARUS: FOREIGN TRADE

(Metric tons unless otherwise specified)

Commodity	Exports	
	1996	1997
Petroleum, refinery products:		
From CIS	405,900	712,300
From rest of world	55,800	70,400

NA Not available.

1/ CIS, Commonwealth of Independent States.

Source: Interfax Statistical Report, 1998, Structure of Foreign Trade by Belarus in 1997 [reported by Belarus Ministry of Statistics and Analysis]: Interfax Statistical Report, v. VII, issue 10, February 27-March 6, 1998, p. 20-22.

THE MINERAL INDUSTRY OF

BELGIUM AND LUXEMBOURG

By Harold R. Newman

The mineral-processing industry was a significant contributor to the Belgian economy in 1997. The refining of copper, zinc, and minor metals and the production of steel, all from imported materials, were the largest mineral industries in Belgium. The extraction and recovery of nonferrous metals were carried out in large-scale, high-technology plants. Europe's largest electrolytic copper and zinc refineries were in Belgium, as was one of the continent's largest lead refineries. The country was also a significant producer of cadmium, germanium, selenium, and tellurium as byproducts from smelting and refining operations.

Although the country is small in size, Belgium had a significant industrial minerals sector. Belgium was an important producer of four groups of industrial materials. These were carbonates, including limestone, dolomite, and whiting; synthetic materials in the form of soda ash and sodium sulfate; silica sand; and construction materials, including a wide range of different types of marble.

Environmental policy in Belgium was the responsibility of the Federal Ministry of the Environment, as well as its comparable ministries in the two separate regions of the country, Flanders and Wallonia. Individual companies were responsible for environmental protection in their own areas of concern and contributed to environmental investment programs. These environmental programs ranged from treating oil effluent to reducing air emissions.

Belgium was a major exporting country and was the ninth largest trading nation in the world, making it one of the highest per capita exporters in the world. It has a long history of reliance on international trade. Three-quarters of Belgium's trade was with other members of the European Union (EU) (U.S. Department of State, January 1998, Belgium, 1997 Country Reports on Economic Policy and Trade Practices, accessed April 15, 1998, at URL http://www.state.gov/www/issues/economic/trade_reports/ europe_canada97/belgium97.html).

Belgium, the Netherlands, and Luxembourg form the BENELUX customs unit. Since 1921, there has been a close economic union between Belgium and Luxembourg. The Belgium-Luxembourg Economic Union (BLEU) has involved the parity of currency, integrated foreign trade (including statistics), a balance-of-payments account, and a joint central bank. International trade data for Belgium were covered in the context of the BLEU and, as such, covered the exports, reexports, and imports of Luxembourg. Other members of the EU were the BLEU's most important trading partners.

The shares of the BLEU's exports accounted for by the EU amounted to 76%. Overall, the BLEU was responsible for 3.2% of world trade and was the world's leading exporter of raw and cut diamonds. Mineral products amounted to 4% of products exported. The top five destinations of exports were, in descending order, Germany, France, the Netherlands, the United Kingdom, and Italy. The top five origins of imports were, in descending order, Germany, the Netherlands, France, the United Kingdom, and the United States ((Belgium-Luxembourg Economic Union in World Trade, 1997, Export statistics, accessed April 15, 1998, at URL http://www.obcebdbhbe/en/Services/stats.html).

Production of mineral commodities generally remained stable or increased somewhat during 1997. Increases in production generally followed the lines of exported goods, such as value-added nonferrous metals. *(See table 1.)*

Table 2 shows the principal mining and mineral-processing facilities in Belgium with their location and capacity. The only mining operations left in Belgium in 1997 were the production of sand and gravel and the quarrying of stone. Marble was an important export commodity. The metal-processing sector of the industry almost exclusively used imported raw materials, whether metal concentrates, scrap, or other materials for smelting and refining, or metal for forming and casting.

Table 3 shows the relation of selected classes of mineral commodities on Belgium-Luxembourg's balance-of-payments position in relation to the EU and the world.

Union Minière SA (UM), a world leader in the nonferrous metal sector, produced and sold more than 20 nonferrous metals. This production and development effort is split into five main areas that include cobalt, copper, germanium, special metals and the metallurgical recovery of precious metals from lead and copper materials, and zinc.

UM was the first company in Flanders to conclude an agreement with the Flemish Government for an integrated approach to deal with soil and ground-water pollution at all its company sites in Flanders. UM has carried out a series of studies into the quality of the soil and ground water at factory sites in Balen, Hoboken, Olen, and Overpelt. At certain places the soil and ground water have been polluted by more than 100 years of industrial activity. The agreement consists of the carrying out of descriptive soil surveys for all sites in Flanders, determining the order of priorities and nature of the remedial projects and carrying out these remediation projects. These measures will take place over a 10-year period (Union Minière S.A., 1997).

UM was also planning to build a new smelter and a new precious metal refinery at its Hoboken plant. These would produce lead, copper, nickel, and precious metals and was expected to be in operation by 1998. Not only will this increase Hoboken's unit capacity and reduce production costs, but it will reduce the amount of time that material is in the process stream and is expected to reduce environmental problems. The smelter will use an ISA smelting process for treating copper-bearing materials (Mining Journal, 1997).

In June 1997, UM was chosen by the Bulgarian privatization agency to enter into exclusive negotiations for the acquisition of a 56% interest in Bulgaria's MDK Pirdop copper smelter. A 5-year investment plan at MDK Pirdop would include a capacity expansion and upgrade of the smelter, the construction of a new refinery, and environmental projects. Costs of the acquisition and investment program would be about $300 million (Mining Journal, 1997).

Cement Bedrijven Nv (CBR) entered into an agreement with the Turkish Bank, Yapi ve Kredi Bankasi A.S., for the acquisition of a 97.7% stake in the Turkish cement company, Canakkale Cimento Sanayii (CCS). The deal, worth an estimated $264 million, will increase CBR's total cement capacity by almost 20%. CCS operated a dry process plant at Canakkale, which had a name plate capacity of 3.2 million metric tons per year, making it the largest cement manufacturer in Turkey (Industrial Minerals, 1997).

Belgium, specifically Antwerp, retained its position in 1997 as the world's largest diamond center with a turnover in diamonds valued at about $22 billion. The diamond industry contributed about $3 billion to the nation's economy. Belgium's international trade in diamonds for 1994 to 1997 is shown in tables 4 and 5.

Belgium is recognized worldwide for the diversity and quality of its dimension stone. The so-called petit granit, actually a dark blue-gray crinoidallimestone, was one of the most important facing stones the country produces. The country has been an important producer of marble for more than 2,000 years. All the marble quarries are in Wallonia. Red, black, and gray are the principal color ranges of the marble, most of which was exported.

When the last coal mines in Belgium closed in 1992, the country became entirely dependent on imported primary energy. Belgium imported coal to meet the needs of the steel, cement, and power-generating industries and all its crude oil for its four petroleum refineries. Belgium's seven nuclear powerplants supplied more than 60% of its electricity needs. Natural gas began to play a more important role as an energy source. Natural gas was considered to be more environmentally acceptable as a fuel, and Belgium, being at the center of the European gas grid, was favorably located for obtaining natural gas.

Belgian National Railways operated 3,568 kilometers (km) of standard-gauge track, 2,563 km of double track, and 2,207 km of electrified, all Government owned. The country had 137,876 km of roadways, of which 129,603 km was paved. The inland waterway system consisted of 2,043 km, of which 1,528 km was in regular use. The principal ports were Antwerp, Brugge, Ghent, Oostende, and Zeebrugge.

Corporate restructuring and the Government policy of budget cuts, split between the Federal Government and the regional authorities of Flanders and Wallonia, were expected to make Belgian products more competitive on the world market. The Belgian export-oriented markets rely heavily on the markets of its trading partners, and where these partners' profits increase and where cash flow increases and improves, Belgium's economy will also experience positive results for the near term.

Luxembourg

Luxembourg's mineral industry consisted principally of raw materials processing and was dominated by the steel company Acieries Reunies de Burbach-Eich-Dudelang S.A., part of the ARBED Group, whose domestic and foreign subsidiaries have interests in steelmaking and steel products, cement, copper foil production, engineering, mining, information systems, and trading, among others.

As a member of the BLEU, trade statistics for Luxembourg are inextricably linked with those of Belgium and, therefore, cannot be listed individually. Steel was the country's main export commodity.

ARBED dominated the mineral industry and was involved in producing pig iron, crude steel, and stainless steel, all from imported material. Also, the company was involved in other areas of the economy, such as the cement and brickmaking industries.

The iron and steel sector remained the most important industrial sector of the economy. Production remained below that of several years ago as an adjustment to meet demand that has been low in the recent past.

Mining in Luxembourg was represented by small industrial mineral operations that produced material for domestic consumption. These minerals included dolomite, limestone, sand and gravel, and slate. *(See table 6.)* Luxembourg's principal producers of mineral industry products are listed in table 7.

Luxembourg is a landlocked country with 272 km of standard-gauge track, 178 km of double track, and 197 km of electrified railways operated by the Luxembourg National Railways. The country had 5,108 km of roadways, of which 4,995 km was paved. The only waterway is the Moselle River, of which 37 km in Luxembourg is navigable, and the only river port was Mertert.

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Institute National de Statistiques
Rue de Louvain 44
1000 Brussels, Belgium
Ministere des Affaires Economiques
NG III Blvd E. Jacqmaain, 154
1000 Brussels, Belgium
Service Geological de Belgique
Rue Jenner 13
1040 Brussels, Belgium
Service Central de la Statistique et des Etudes Economiques (STATEC)
6, boulevard Royal
2013 Luxembourg

TABLE 1
BELGIUM: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/		1993	1994	1995	1996	1997 e/
METALS						
Aluminum, secondary including unspecified metals e/		4,000	4,000	4,000	3,000	2,000
Arsenic, white e/		2,000	2,000	2,000	2,000	2,000
Bismuth metal e/		950	900	900	800	800
Cadmium, primary		1,573	1,556	1,710	1,580 e/	1,420 3/
Cobalt, primary e/		--	1,200	1,000	1,000	1,000
Copper:						
Blister: e/						
Primary		200	2,600	1,000	--	--
Secondary		141,500	145,000	146,000	157,300 r/	142,500
Total		141,700	147,600	147,000	157,300 r/	142,500
Unwrought, total of smelter and refined, primary and secondary including alloys e/		455,235 3/	468,000	465,000	470,000	450,000
Refined, primary and secondary, including alloys		378,890	371,152	376,000 r/	354,000 r/	390,000
Iron and steel:						
Pig iron	thousand tons	8,178	8,974	9,199	8,628 r/	8,077 3/
Ferroalloys, electric furnace, ferromanganese e/		25,000	25,000	25,000	25,000	25,000
Steel:						
Crude	thousand tons	10,173	11,319	11,606	10,773 r/	10,738 3/
Hot-rolled products	do.	9,750	11,266	11,540	10,963 r/	11,000
Lead:						
Smelter: e/						
Primary 4/		76,000	76,000	75,000	75,000	75,000
Secondary 5/		25,400 3/	25,500	25,000	25,000	25,000
Total		101,400	101,500	100,000	100,000	100,000
Refined:						
Primary		105,712	97,200	95,300 e/	94,400 e/	84,400
Secondary		25,400	26,300	26,400 e/	31,000 r/ e/	26,400 3/
Total		131,112	123,500	121,700 e/	125,400 r/ e/	110,800
Selenium e/		250	250	250	250	250
Tin metal, secondary including alloys e/		5,000	5,000	5,000	3,000	3,000
Zinc:						
Slab:						
Primary		209,600	211,200	211,100	207,400 e/	213,600 3/
Secondary (possibly remelted zinc) e/		90,000	95,000	29,000	27,000 e/	30,000
Total		299,600	306,200	240,100	234,400 e/	243,600
Powder		37,700 3/	40,000	36,000	36,000	36,000
INDUSTRIAL MINERALS						
Barite e/		30,000	30,000	30,000	30,000	30,000
Cement, hydraulic e/	thousand tons	7,612 3/	8,000	8,000	6,997 3/	7,001 3/
Clays, kaolin e/	do.	300	300	300	300	300
Lime and dead-burned dolomite, quicklin	do.	1,750	1,750	1,800	1,800	1,750
Nitrogen, N content of ammonia e/	do.	535 3/	500	500	500	500
Sodium compounds: e/						
Soda ash	do.	375	--	--	--	--
Sulfate	do.	250	250	250	250	250
Stone, sand and gravel: e/						
Calcareous:						
Alabaster e/		1,000	1,100	1,167 3/	1,144 3/	1,151 3/
Dolomite e/	thousand tons	4,000	4,000	4,000	3,379 3/	3,466 3/
Limestone	do.	33,400 3/	33,500	33,000	33,000	30,000
Marble:						
In blocks	cubic meters	250	250	275	275	300
Crushed and other		80	80	100	100	100
Petit granite (Belgian bluestone):						
Quarried	cubic meters	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
Sawed	do.	90,000	90,000	100,000	100,000	100,000
Worked	do.	15,000	15,000	15,000	15,000	15,000
Crushed and other	do.	800,000	800,000	800,000	800,000	800,000
Porphyry, all types	thousand tons	4,000	4,000	4,000	4,000	4,000

See footnotes at end of table.

BELGIUM: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/		1993	1994	1995	1996	1997 e/
INDUSTRIAL MINERALS--Continued						
Stone, sand and gravel--Continued:						
Petit granite (Belgian bluestone)--Continued:						
Quartz and quartzite		500,000	500,000	500,000	500,000	500,000
Sandstone:						
Rough stone including crushed	thousand tons	2,400	2,400	2,400	2,400	2,400
Paving		14,000	14,000	15,000	15,000	14,000
Sand and gravel:						
Construction sand	thousand tons	9,200	9,200	9,000	9,000	9,000
Foundry sand		525,000	525,000	500,000	500,000	500,000
Dredged sand	thousand tons	2,300	2,300	2,300	2,300	2,300
Glass sand	do.	1,950	1,950	1,900	1,900	1,900
Other sand	do.	2,800	2,800	2,800	2,800	2,800
Gravel, dredged	do.	5,000	5,000	5,000	5,000	5,000
Sulfur: e/						
Byproduct:						
Elemental		160,000	160,000	160,000	160,000	160,000
Other forms		140,000	140,000	140,000	140,000	140,000
Total		300,000	300,000	300,000	300,000	300,000
Sulfuric acid, oleum	thousand tons	2,000	2,000	2,000	2,000	2,000
MINERAL FUELS AND RELATED MATERIALS						
Carbon black e/		1,700	1,700	1,500	1,500	1,500
Coke, all types	thousand tons	3,895	3,673	3,600 e/	3,550 3/	3,401 3/
Gas, manufactured e/	thousand cubic meters	550,000	550,000	550,000	422,412 3/	372,095 3/
Petroleum refinery products:						
Liquefied petroleum gas	thousand 42-gallon barrels	4,620	5,930	5,500 e/	13,321 3/	13,607 3/
Naphtha and white spirit e/	do.	9,200	9,200	9,000	10,710 3/	13,354 3/
Gasoline	do.	47,700	48,500	50,000 e/	50,549 3/	57,979 3/
Jet fuel	do.	12,100	13,200	13,000 e/	13,000 e/	13,000
Kerosene	do.	597	566	600 e/	600 e/	600
Distillate fuel oil	do.	79,800	85,100	85,000 e/	85,000 e/	85,000
Refinery gas e/	do.	3,500	3,500	3,500	3,500	3,500
Residual fuel oil e/	do.	43,900 3/	37,600	38,000	46,286 3/	51,244 3/
Bitumen e/	do.	4,000	4,000	4,000	4,677 3/	5,766 3/
Other e/	do.	8,500	8,500	8,500	8,500	8,500
Refinery fuel and losses e/	do.	11,700 3/	12,000	12,000	12,000	12,000
Total e/	do.	225,617	228,096	229,100	248,143	264,450

e/ Estimated. r/ Revised.

1/ Table includes data available through May 1998.

2/ In addition to the commodities listed, Belgium produced a number of other metals and alloys, for which only aggregate output figures were available.

3/ Reported figure.

4/ Data not reported; derived by taking reported total lead output plus exports of lead bullion less imports of lead bullion.

5/ Data represent secondary refined lead output less remelted lead; as such, the figures are probably high because they include some lead that was sufficiently pure as scrap that it did not require resmelting; data are not adequate to permit differentiation.

TABLE 2
BELGIUM: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cadmium, metal	tons	Vieille-Montagne NV	Balen-Wezel	1,550
Do.	do.	NV Metallurgie Hoboken-Overpelt SA (NV MHO SA)	Overpelt	600
Cement		Major companies:		8,400
			Of which:	
Do.		Cimenteries CBR SA (Societe Generale de Belgique, or SGB)	Plants at Lixhe, Mons/Obourg, Harmignies, Marchienne, Ghent, et al.	(3,200)
Do.		Ciments d'Obourg SA	Plants at Obourg and Thieu	(2,800) 1/
Do.		Compagnie des Ciment Belge (Ciments Francais)	Plant at Gaurain-Ramecroix	(2,400)
Copper		Metallurgie Hoboken-Overpelt SA (Union Minière SA)	Smelter at Antwerp-Hoboken Refinery at Olen	50 330
Do.		Metallo-Chimique NV	Smelter at Beerse	80
Dolomite		Carsambre SA Dolomeuse	Quarry at Floreffe	300
Do.		do.	Quarry at Marche les Dames	600
Do.		do.	Plant at Namur	37
Do.		SA de Marche-les-Dames	Quarries at Vezin and Scalaigneaux and Scalaigneaux	300
Do.		do.	Plant at Vezin	35
Do.		SA des Dolomies de Marche-les-Dames	Quarry at Nameche	300
			Of which:	
Do.		do.	Soft-burned	500
Do.		do.	Dead-burned	200
Do.		SA Dolomies de Villiers-le-Gambon	Quarry at Villiers-le-Gambon	300
Lead, metal		Metallurgie Hoboken-Overpelt SA (Union Minière SA)	Smelter at Antwerp-Hoboken Refinery at Antwerp-Hoboken	90 125
Petroleum, refined	42-gallon barrels per day	Refineries:		602,000
			Of which:	
Do.	do.	Fina Raffinaderji Antwerp	Refinery at Antwerp	(268,000)
Do.	do.	SA Esso NV	do.	(239,000)
Do.	do.	Belgian Refining Corp.	do.	(80,000)
Do.	do.	Nynas Petroleum NV	do.	(125,000)
Steel:		Companies:		14,000
			Of which:	
Do.		Cockerill Sambre SA (Government of Wallonia, 80%)	Plants at Liège and Charleroi	(5,000)
Do.		Sidmar NV (ARBED in Luxembourg, 66.97%; Belgian Government, 28.11%)	Plant at Ghent	(3,960)
Do.		Usines Gustave Boël NV	Plant at La Louviere	(2,020)
Do.		Forges de Clabecq SA	Plant at Clabecq	(1,500)
Do.		SA FAbrique de Fer de Charleroi	Plant at Charleroi	(600)
Do.		ALZ NV	Plant at Genk-Zuid	(360)
Do.		New Tubemeuse (NTW) SA	Plant at Flemalle	(300)
Zinc, metal		Vieille-Montagne SA (Union Minière SA)	Smelter at Balen-Wezel	385

1/Includes the capacity of the company SA Ciments de Haccourt.

TABLE 3
BELGIUM-LUXEMBOURG: BALANCE OF PAYMENTS, SELECTED MINERAL COMMODITIES IN 1996 1/

(Thousand dollars)

Mineral commodity	Exports to EU 2/	Imports from EU	Net gain or (loss)	Exports to the world	Imports from the world	Net gain or (loss)
Crude industrial minerals:						
Clays, kaolin	$39,117	$60,067	($20,950)	$47,470	$79,193	($31,723)
Feldspar	4	3,486	(3,482)	155	9,719	(9,564)
Magnesite	145	119	26	157	182	(25)
Marble	6,866	9,550	(2,684)	7,193	9,886	(2,693)
Slate	2,498	6,636	(4,138)	2,602	6,861	(4,259)
Other	515,587	503,531	12,056	600,281	781,153	(180,872)
Total	564,217	583,389	(19,172)	657,858	886,994	(229,136)
Metalliferous ores:						
Copper	6	151	(145)	630	11,839	(11,209)
Lead	6,857	15,204	(8,347)	6,920	70,051	(63,131)
Tin	22	2	20	103	6	97
Zinc	99,302	66,793	32,509	100,288	177,193	(76,905)
Other (including waste and scrap)	451,734	1,549,688	(1,097,954)	720,203	2,726,837	(2,006,634)
Total	557,921	1,631,838	(1,073,917)	828,144	2,985,926	(2,157,782)
Nonmetallic mineral manufactures:						
Diamonds, natural, not set or strung	1,563,654	2,921,895	(1,358,241)	10,693,881	10,268,270	425,611
Lime	247	8,940	(8,693)	259	8,941	(8,682)
Mica	20,603	1,019	19,584	20,603	1,749	18,854
Millstones, grindstones, etc.	66,010	48,164	17,846	75,381	66,026	9,355
Portland cement	110,958	40,830	70,128	247,077	52,414	194,663
Precious stones, natural	3,187	816	2,371	30,425	33,949	(3,524)
Precious stones, synthetic	1,183	549	634	2,061	1,921	140
Stone, building	64,761	107,825	(43,064)	69,389	120,504	(51,115)
Sulfuric acid	21,627	17,796	3,831	23,070	18,955	4,115
Metals:						
Aluminum, metal including alloys:						
Unwrought	209,857	628,078	(418,221)	221,371	763,369	(541,998)
Semimanufactures	1,128,045	613,559	514,486	1,330,793	692,216	638,577
Total	1,337,902	1,241,637	96,265	1,552,164	1,455,585	96,579
Iron and steel	8,479,968	4,252,481	4,227,487	10,065,056	4,825,523	5,239,533
Magnesium, metal including alloys:						
Scrap	121	5	116	1,217	5	1,212
Unwrought	8,398	9,168	(770)	8,415	13,008	(4,593)
Semimanufactures	2,837	3,356	(519)	3,129	3,903	(774)
Total	11,356	12,529	(1,173)	12,761	16,916	(4,155)
Mercury	50	121	(71)	80	165	(85)
Other nonferrous metals	2,474,261	978,639	1,495,622	2,915,386	2,007,170	908,216
Total, metals	10,957,116	5,234,597	5,722,519	12,983,651	6,836,761	6,146,890
Mineral fuels	3,201,678	6,570,336	(3,368,658)	4,423,277	9,246,323	(4,823,046)

1/ Table prepared by Glenn J. Wallace, International Data Unit.

2/ EU, European Union.

TABLE 4
BELGIUM: EXPORTS AND REEXPORTS OF DIAMOND

	1995		1996		1997	
Destinations	Quantity (carats)	Value (thousands)	Quantity (carats)	Value (thousands)	Quantity (carats)	Value (thousands)
Sorted, unworked or simply sawn, cleaved, or bruted:						
Hong Kong	1,822,776	$37,003	1,721,275	$50,953	2,860,048	$66,911
India	82,547,659	2,249,640	92,531,981	2,083,237	121,751,318	2,440,453
Israel	7,051,162	1,835,839	6,298,635	1,962,882	7,409,619	2,095,025
Malaysia	415,042	78,298	375,367	72,642	265,408	48,682
South Africa	89,718	53,388	154,400	48,553	66,584	30,330
Sri Lanka	1,244,669	211,220	733,684	108,928	646,505	93,782
Switzerland	507,073	144,882	1,411,670	154,026	2,070,510	114,520
Thailand	1,244,669	211,220	1,303,693	219,934	1,050,297	157,175
Tunisia	33,700	5,131	36,168	5,957	38,139	5,855
United Kingdom	5,003,377	578,951	7,876,475	825,335	3,358,291	424,614
United States	533,905	365,429	530,992	398,945	881,271	384,069
Unspecified	460,771	440,294	3,827,633	315,238	96,303,222	355,555
Total	100,954,525	5,842,745	116,801,973	6,246,630	145,134,025	6,216,971
Worked, but not mounted or set:						
Germany	312,174	$228,281	315,215	$214,978	295,258	$199,383
Hong Kong	828,602	539,027	1,002,874	568,501	1,162,034	606,471
Israel	526,382	342,204	634,934	405,122	633,472	473,391
Italy	311,296	148,354	370,723	196,059	528,794	259,159
Japan	527,585	691,432	506,836	549,176	301,170	346,389
Switzerland	615,554	472,952	587,933	482,261	572,266	399,052
Thailand	281,740	205,528	293,465	223,996	161,141	97,099
United Kingdom	189,034	263,017	212,571	317,910	226,494	260,769
United States	1,572,308	1,312,395	1,670,123	317,910	1,735,450	1,626,132
Unspecified	1,029,256	693,277	1,378,337	810,254	1,383,563	917,708
Total	6,193,931	4,896,467	6,973,011	5,191,510	6,999,642	5,098,163

Source: Diamond International, March-April, 1998. no 52. London, United Kingdom.

TABLE 5
BELGIUM: IMPORTS OF DIAMONDS

Sources	1995		1996		1997	
	Quantity (carats)	Value (thousnads)	Quantity (carats)	Value (thousands)	Quantity (carats)	Value (thousands)
Natural rough, unsorted, and unworked or simply sawn, cleaved, or bruted:						
Angola	562,665	$152,948	820,153	$229,375	1,004,581	$270,282
Australia	9,158,490	62,680	27,341,654	191,805	40,230,158	264,334
Commonealth of Independent States	4,802,359	131,856	5,124,706	140,270	5,508,142	127,962
Côte d'Ivoire	1,614,396	121,046	5,124,706	202,685	885,351	116,325
Israel	2,667,741	366,300	2,865,656	451,316	3,398,447	527,177
Liberia	10,677,741	757,338	12,329,009	611,532	5,803,113	327,061
Sierra Leone	455,062	88,277	556,457	92,747	802,862	114,326
Switzerland	635,814	127,618	1,569,869	111,008	3,730,175	934,886
United Kingdom	28,862,328	2,474,073	39,911,802	2,745,058	47,181,667	2,845,127
United States	963,080	103,847	509,826	102,718	844,771	111,586
Zaire, Republic of	23,113,137	1,067,263	22,755,452	1,270,511	19,630,738	1,000,608
Unspecified	13,351,744	897,770	13,889,327	940,229	12,902,995	73,942
Total	95,864,524	6,351,016	129,888,307	7,089,254	143,378,800	6,713,616
Worked, but not mounted or set:						
Commonwealth of Independent States	515,759	431,689	822,136	583,577	454,896	335,255
Germany	163,280	125,197	155,536	111,557	134,730	99,819
Hong Kong	276,698	188,375	274,680	172,785	344,473	259,174
India	2,076,986	724,182	2,424,577	755,234	2,318,055	709,508
Israel	458,301	474,617	511,631	544,051	567,832	584,564
South Africa	87,648	136,855	91,295	143,335	80,732	111,126
Sri Lanka	240,111	114,283	243,522	109,047	232,111	101,603
Switzerland	193,787	255,256	147,436	276,009	165,098	249,490
Thailand	430,544	231,311	378,130	214,028	375,904	197,047
United Kingdom	103,003	195,419	106,808	235,772	86,537	148,915
United States	579,267	508,253	685,971	597,948	646,994	667,265
Unspecified	758,472	507,621	914,893	594,184	1,053,330	683,704
Total	5,883,856	3,893,058	6,756,615	4,337,527	6,460,692	4,147,470

Source: Diamond International, March-April, 1998, no. 52, London.

TABLE 6
LUXEMBOURG: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity	1993	1994	1995	1996	1997e/
Cement, hydraulic e/	620,000	620,000	600,000	600,000	580,000
Gypsum and anhydrite, crude e/	400	400	400	400	400
Iron and steel, metal:					
Pig iron	2,411,000	1,927,000	1,028,000 r/	829,000 r/	437,000 3/
Steel:					
Crude	3,293,000	3,092,000	2,613,000 r/	2,501,000 r/	2,580,000
Semimanufactures	3,650,000	3,620,000	2,407,000 r/	2,313,000 r/	2,400,000
Phosphates: Thomas slag: e/					
Gross weight	555,000	472,000	500,000	500,000	500,000
P_2O_5 content	100,000	75,000	75,000	75,000	75,000

e/ Estimated. r/ Revised.

1/ Table includes data available through March 1998.

2/ Construction materials, such as dimension stone and sand and gravel, are also produced, but the amounts are no longer reported, and no basis exists for the formulation of reliable estimates of output levels.

3/ Reported figure.

TABLE 7
LUXEMBOURG: STRUCTURE OF THE MINERAL INDUSTRY IN 1996

(Thousand metric tons)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement	SA des Ciments Luxembourgeois (Acieries Reunies de Burbach-Eich Dudelang, 50%; Societe Generale de Belgique, 25%)	Plant at Esch-sur-Alzette	450
Do.	Intermoselle SARL (ARBED, 33%)	Plant at Rumelange	1,000
Steel	Acieries Reunies de Burbach-Eich-Dudelang (ARBED) (Societe Generale de Belgique, 25%; Belgian Government, 31%; others)	Plants at Differdange, Dudelange, Esch-Belval, and Esch-Schifflange	5,320

THE MINERAL INDUSTRY OF

BOSNIA AND HERZEGOVINA

By Walter G. Steblez

Bosnia and Herzegovina is endowed with a wide range of minerals used to produce metals, construction materials, chemicals, and fuels. Before 1991, Bosnia and Herzegovina had accounted for the major share of the former Yugoslavia's production of alumina, asbestos, bauxite, barite, brown coal, gypsum, iron ore, and steel. The country also had been a substantial producer of aluminum, dolomite, and kaolin. The civil war of 1992-95 resulted in extensive damage to the country's industrial plants, mines, and infrastructure. The cost of repair of damaged industrial facilities was estimated to be $20 million. The country's postwar economy was under severe duress that resulted not only from physical damage to industrial plant and infrastructure, but also from massive dislocations of settled populations throughout wide areas of the country. The overall economic downturn in 1996 was significant because the gross domestic product declined by 75% compared with that of the prewar level of 1991 (Foreign Broadcast Information Service, 1996). In addition, according to information supplied by news sources in Serbia and Montenegro, the area of Bosnia and Herzegovina known as "Republica Srpska" controlled substantial portions of Bosnia and Herzegovina's mineral resources. The share of Bosnia and Herzegovina's mineral resources under exploitation within "Republica Srpska" was as follows: bauxite, 12%; brown coal, 37%; gypsum, 88%; iron ore, 68%; lead and zinc ore, 35%; lignite, 12%; and quartz, 89% (Foreign Broadcast Information Service, 1994). Table 1 provides estimates of Bosnia and Herzegovina's production of mineral commodities; table 2 presents the country's minerals industry structure—the major mining and processing enterprises, their locations and capacities.

In 1997, Bosnia and Herzegovina continued to recover from the civil war. Reconstruction and repair of the country's system of transportation and communication were undertaken with financial assistance from the World Bank for Reconstruction and Development and the European Bank for Reconstruction and Development. The major mineral inputs into the reconstruction effort included steel, cement, and sand and gravel. At yearend 1996, Caterpillar Corp. of the United States sold mining equipment worth $10 million to the Kakaj Coal Mining Company. The equipment, supplied under the auspices of the U.S. Agency for International Development (USAID) Emergency Infrastructure and Services Program, will be used to raise coal production. Morrison Knudsen of the United States assisted the USAID's U.S. Project Management Assistance Group in concluding the equipment sale (Mining Magazine, 1996).

The Government's efforts to establish market economy norms through legislation were generally in beginning stages by yearend 1997. The country's reconstruction will continue to require inputs of steel and industrial minerals, of which there are sufficient domestic resources to meet most needs.

Bosnia and Herzegovina's inland system of ways and communications comprised railroads, highways, and waterways. Although data in respect to the total lengths of the railroad and inland waterway systems had not yet been officially reported, the highway and road system reportedly consisted of 21,168 kilometers (km) of paved, gravel, and earth-surfaced road, of which 11,436 km was paved, 8,146 km was gravel, and 1,586 km was earth surfaced. The country was entirely landlocked and did not possess a merchant marine fleet. Pipelines for the carriage of petroleum were 174 km in length; however, data for those carrying natural gas were not available.

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TABLE 1
BOSNIA AND HERZEGOVINA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/		1993	1994	1995	1996	1997
METALS						
Aluminum:						
Bauxite		100,000	75,000	75,000	75,000	75,000
Alumina		50,000	50,000	50,000	50,000	40,000
Metal, ingot; primary and secondary		15,000	15,000	15,000	15,000	15,000
Iron and steel:						
Ore and concentrate:						
Ore, gross weight		250,000	200,000	150,000	100,000	100,000
Ore, Fe content		70,000	70,000	52,000	35,000	35,000
Agglomerate		50,000	50,000	50,000	40,000	40,000
Metal:						
Ferroalloys:						
Ferrosilicon		1,000	1,000	1,000	1,000	1,000
Silicon		200	200	200	100	100
Pig iron		100,000	100,000	100,000	100,000	100,000
Crude steel:		115,000	115,000	115,000	115,000	110,000
Semimanufactures		150,000	100,000	100,000	100,000	100,000
Lead:						
Mineral concentrator output:						
Ore, gross weight (Pb-Zn ore)		10,000	10,000	10,000	10,000	10,000
Pb content of ores		200	200	200	200	200
Pb concentrate		400	400	400	400	400
Metal, smelter, primary and secondary		100	100	100	100	100
Manganese ore:						
Gross weight		2,000	2,000	2,000	2,000	2,000
Mn content		600	600	600	500	500
Zinc:						
Zinc content of Pb-Zn ore		350	300	300	300	300
Concentrate output, gross weight		600	600	600	600	600
INDUSTRIAL MINERALS						
Asbestos, all kinds		500	500	500	500	500
Barite concentrate		2,000	2,000	2,000	2,000	2,000
Cement	thousand tons	150	150	150	150	200
Clays:						
Bentonite		800	800	800	800	800
Ceramic clay, crude		20,000	20,000	20,000	20,000	20,000
Kaolin:						
Crude		3,000	3,000	3,000	3,000	3,000
Calcined		1,500	1,500	1,500	1,500	1,500
Gypsum:						
Crude		30,000	30,000	30,000	30,000	30,000
Calcined		3,000	3,000	3,000	3,000	3,000
Lime	thousand tons	50	50	50	50	50
Magnesite, crude		2,000	2,000	2,000	2,000	2,000
Nitrogen, N content of ammonia		2,000	2,000	2,000	500	500
Quartz, quartzite, glass sand: Glass sand		50,000	50,000	50,000	50,000	50,000
Salt, all sources		50,000	50,000	50,000	50,000	50,000
Sand and gravel, excluding glass sand	thousand cubic meters	500	500	500	500	500
Sodium compounds:						
Soda ash		20,000	20,000	10,000	10,000	5,000
Caustic soda		10,000	10,000	10,000	10,000	5,000
Sodium bicarbonate		1,000	1,000	1,000	1,000	500
Stone, excluding quartz and quartzite, Dimension, crude:						
Ornamental	square meters	20,000	20,000	20,000	20,000	20,000
Other	cubic meters	2,000	2,000	2,000	2,000	2,000
Crushed and brown, n.e.s.	thousand cubic meters	500	500	500	500	500
Sulfur, Byproduct of metallurgy		1	1	1	1	1
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Brown coal	thousand tons	1,000	1,000	1,000	1,000	1,000
Lignite	do.	1,500	1,500	1,500	1,000	1,000
Coke		100	100	100	--	--
Petroleum refinery products	thousand 42-gallon barrels	--	--	--	--	500

1/ Table includes data available through April 1998.

2/ In addition to commodities listed, common clay was also produced, but available information was inadequate to make reliable estimates of output levels.

TABLE 2

BOSNIA AND HERZEGOVINA: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Alumina		Energoinvest	Plants at Birac-Zvornik	600
Do.		do.	Plant at Mostar	280
Aluminum		do.	Smelter at Mostar	92
Bauxite		do.	Mines at Vlasenica, Jajce, Bosanska Krupa, Posusje, Listica, Citluk, and other locations.	2000
Coal:				
Brown		SOUR Titovi Rudnici Uglja, Tuzla	Mines in BiH	12,000
Lignite		do.	do.	7,000
Cement		Gik Hidrogradnja, Tvornica Cementa BiH	Plant at Kakanj	650
Ferroalloys		Elktrobosna, Elektrohemijska i Eletrotermijska Industrija	Plant at Jajce	80
Iron ore		Rudarsko Metalurski Kombinat Zenica	Mines at Vares, Ljubija, and Radovan	5000
Lead-zinc ore		Energoinvest	Mine and mill at Srebrenica	300
Manganese ore		Mangan-Energoinvest	Mine and concentrator at Buzim	100
Petroleum:				100
Refined	thousand barrels per day	Energoinvest: Rafinerija Nafte Bosanski Brod	Refinery at Bosanski Brod	
Pig iron		Rudarsko metalurski Kombinat Zenica (RMK Zenica)	4 blast furnaces at Zenica 2 blast furnaces at Vares	2,250 100
Do.		do.	Electric reduction furnaces at Iljas	100
Salt	cubic meters per year	Hemijski Kombinat "Sodaso," Rudnik Soli i Solni Bunari	Rock salt: Mines at Tusanj	120,000
Do.	do.	do.	Production from brine at Tuzla, BiH	2000000
Steel, crude		Rudarsko Metalurski Kombinat Zenica	Plant at Zenica	2,060

THE MINERAL INDUSTRY OF

BULGARIA

By Walter G. Steblez

The period from 1996 to 1997 was a significant watershed in Bulgaria's transition to a market economy. Despite preliminary signs of slow economic activity in 1996, on balance, 1996 and 1997 saw major efforts made to stimulate private ownership in the economy and to attract foreign investment in the country's mineral industries.

In 1997, Bulgaria's gross domestic product (GDP) declined by 7% compared with that of 1997. This was a significant improvement compared with that of 1996 when the GDP declined by about 11% compared with that of 1995. The value of industrial production in 1997 also declined by more the 7%. In 1997, inflation was highlighted by a sharp devaluation of the currency. Although the rate of inflation was expected to reach 550%, it was anticipated that it would decline to 12% by year end 1998 and 7% by 1999 mainly owing to the efforts of the new Government (elected in April) and the establishment of a currency board, which pegged the Bulgarian lev to the Deutsche mark (DME1=BL1000). The Government of Bulgaria agreed to maintain hard currency reserves in quantities that would be sufficient to cover all levs in circulation, as well as those being held as commercial banking reserves in the central bank (U.S. Department of Commerce, 1997).

The Government remained committed to transforming the economy to a market-based system. The legal basis for this transformation was the Law on Transformation and Privatization of State and Municipal-Owned Enterprises, which was adopted by Parliament in 1992. At the same time, the Privatization Agency was created to develop plans for the sale of Government assets valued in excess of BL 70 million (increased to BL 350 million in 1997). The Government's privatization program was to use direct sales and tender offerings.

State-owned assets that were to remain entirely state owned were the Bulgarian State Railroads, Bulgargas (gas industry), Bulgarian Posts, Education and Sciences Establishment, Cartography Company, National Cadastral Company, National Geodesy Company, Geopribor (geological equipment production), Geozashchita, and Vodokanalenzhnir (water main engineering) (U.S. Department of Commerce, 1997). Enterprises in which the Government was to retain at least a 51% controlling interest included Balkan Airlines, the Russe and the Varna merchant fleets, major airports and seaports, and construction companies involved in highway, railroad, and seaport construction.

The abatement of pollution from mineral industry point sources remained an important issue in 1997. In 1989, the beginnings of the dissolution of the centrally planned economy regimes in Eastern Europe, concentrations of sulfur dioxide (SO_2) in Bulgaria were, with the exception of Poland, the highest in the former Council for Mutual Economic Assistance (CMEA) block. In all areas affected by coal-burning point sources of atmospheric pollution, concentrations of SO_2, nitrogen oxide (NO_x), and particulate was above the health safety level. The emissions of SO_2 and NO_x amounted to 1.7 million metric tons (Mt) and 300,000 metric tons (t), respectively, and more than 2 Mt of other pollutants was released into the environment. (*See table 1.*) Additionally, only 1 out of the 13 major rivers in the country was considered to be clean. Numerous stretches of the rest of Bulgaria's rivers were contaminated to varying degrees by discharges from heavy industry, open pit mines, and agricultural runoff (Natsionalen Statisticheski Institut, 1989-93). Radioactive wastes also reportedly were discharged into the Danube River from the Kozloduy nuclear electric power plant.

In the early 1990's, Bulgarian data showed a decline in total pollution—the total level of pollution generated during 1992 was 30% to 40% less than that during 1991. This was, however, attributable more to a decline in the level of the country's industrial output during this period than to a significant assimilation of pollution-abatement technology.

The latest data available on environmental protection efforts in Bulgaria were for 1996 and show a steady increase in expenditures for environmental protection assets and their operational costs from 1992 to 1996. (*See table 2.*)

The sharp increase in outlays for environmental protection from 1993 to 1996 appears to have produced a corresponding decline in total emissions of contaminants into the atmosphere in 1996, given a steady or even slight increase in output levels during this period. (*See table 1.*)

By world standards, Bulgaria remained a modest producer of nonferrous metal ores and concentrates, which met most of the country's domestic and export requirements. Small amounts of iron and manganese ores and a variety of industrial minerals also were mined (asbestos, barite, fluorspar, gypsum, and limestone), largely for domestic consumption.

In 1997, Bulgaria's production of such metals as cadmium, copper, manganese, pig iron, and steel and steel semi manufactures showed overall recovery compared with most output levels in 1996. During the same period, however, the output of rolled aluminum, lead and zinc ores, leads concentrate, lead metal, and silver declined by about 9%, 7%, 2%, 3%, and 35%, respectively. Most categories of mineral fuel production declined in 1997 compared with those of 1996. Total coal output declined by 5%; petroleum production, about 18% (petroleum production, however, is negligible); and natural gas production, by about 9%. With the exception of limestone and dolomite, the production of most major categories of industrial minerals declined sharply during the year. (*See table 3.*)

The volume of Bulgaria's trade for selected minerals from 1992 to 1996 is shown in tables 4 and 5. Bulgaria was a net importer of coal from 1993 to 1996; in 1996, the value of these imports amounted to more than US$18 million (US$1=1.754.4BL). In 1996, Bulgaria also was a net exporter of iron and steel products and construction materials, the net values of which amounted to more than about US$24 million and US$3.4 million, respectively. Having been a net importer from 1992 to 1995, Bulgaria became a net exporter of chemicals in 1996, with the net value of exports amounting to more US$50 million (Natsionalen Statisticheski Institut, 1997, p. 244, 245). In 1996, the value of exports of basic mineral and mineral-related commodities was 425% greater than that of imports; this represented a significant change from 1995 when the value of exports was about 220% greater than that of imports.

The pattern of consumption of most major minerals raw material commodities followed the general production trend; namely, contraction during the period of transition to a market economy. (*See table 6.*)

Metals have been a substantial component of the mineral industry's production profile. Mine output included copper, iron, lead and zinc, and manganese. Additionally, byproduct gold, silver, molybdenum, and other metals were produced, chiefly from processing copper and lead and zinc ores. During the period of economic transition (1991 to 1997), consumption patterns (parallel with those of production) in the country's economy showed widespread declines compared with production and consumption patterns in the 1980's because end use was no longer under a central planning stimulus. Compared with consumption levels in 1992, some increases in consumption were noteworthy with respect to cement, energy, and several iron and steel semi manufactures.

Bulgaria's major copper deposits have been exploited in the Srednogorie-Panagjurishte region. The Asarel-Medet Co. and Elatzite-Med Ltd. surface mines and the Chelopech Ltd. underground mine were in operation. MDK S.A.'s copper smelter and refinery operated in this region at Pirdop (Kraicheva, 1996). The Asarel-Medet and the Elatsite open pit operations mined a low-grade porphyry ore (0.2%-0.5% Cu), which was offset somewhat by the lesser expense of open pit mining, but which also posed more serious environmental problems. At Asarel-Medet, about US$3 million per year has been earmarked for environmental protection (Tsotsorkov, 1998).

The Chelopech mining operation [about 70 kilometers (km) east of Sofia] works a polymetallic deposit containing copper and precious metals. Gold was the most important element because it represents a major portion of Bulgaria's gold reserve. The high arsenic content of the ore, however, has been the cause of serious environmental concerns. Additionally, copper was mined from skarn-vein-type copper ore in the Burgasko-Strandjanski region of the country (Kraicheva, 1996).

In 1997, the major technical and economic parameters at Chelopech were as follows:

- Cost of production of 1 metric ton (t) of ore— 16,023 BL
- Basic equipment:
  - one Damrock minematic drill carriage
  - one Boomer drill carriage
  - five Toro load-haul-dump machines
  - two Simba Junior drill rigs
  - one Solo drill rig
  - one charge loader
  - seven 10KR-2 (K-10) electric locomotives
- Productivity (per capita):
  - ore, 1,903 metric tons per year (t/yr)
  - ore and overburden, 2,074 t/yr

The ore from Chelopech was processed at the independently owned and operated beneficiation plant belonging to Bimak AD, where it passes through primary, secondary, and tertiary crushing to a minus 20-millimeter (mm) sizes. The sized ore then passes through a ball mill that operates with a closed-loop 750-mm-diameter hydrocyclone (second stage). The material from the second-stage hydrocyclone (65%-70%, minus 0.08 mm) is entrained to the flotation shop. The copper and pyrite concentrates undergo dewatering in SP-18 thickeners and vacuum-drum filters.

In 1997, the technical operating parameters of the Bimak concentrator, which included feestock from Chelopech, were as follows (Vylchev and Kesyakov, 1998):

- Ore processed— 587,900 t
- Metal content of the ore
  - copper (percentage)— 1.2
  - gold (grams per ton)— 3.5
- Recovery of copper in copper concentrate (percentage)— 81.28
- Copper concentrate produced, gross weight (thousand tons)— 32.2
  - copper content (percentage)— 18
  - gold content (grams per ton)— 36.24
- Pyrite concentrate produced, gross weight (thousand tons)— 60.0
  - copper content (percentage)— 0.96
  - gold content (grams per)— 7.35
- Gravity separation concentrate, gross weight (tons)— 2.05
  - gold content (percentage)— 5.16
- Gold recovery (percentage):
  - copper concentrate— 61
  - pyrite concentrate— 21.5
  - gravity concentrate— 5.1

Major issues concerning Bulgaria's copper and copper-gold branches in 1997 and involved the Chelopech mining and MDK smelting operations. In June, Navan Resources Plc. of Ireland, a major investor in the Chelopech mining operation, reported significant discoveries of gold mineralization within its Etropole-Iskar licence area, about 40 to 50 km northwest of Chelopech. The discoveries were made during the company's first-quarter exploration program (Mining Magazine, 1997). Also in midyear, Navan and Homestake Mining Co. of the United States announced an agreement to expand operations at Chelopech and to conduct jointly exploration of Navan's highly prospective licenced properties, as well as to develop jointly commercially valuable deposits in the area. Upon final approval by the companies' shareholders, the agreement called for Homestake to make a direct investment in Chelopech, amounting to US$30 million; to fund US$10 million contingency standby loans for the operation; and to provide US$8 million to finance a new joint venture to conduct exploration (Homestake Mining Company, 1997; Skillings Mining Review, 1997).

Homestake's increased involvement with Chelopech began with its decision in 1996 to exercise its option to acquire a 50% stake in Navan Bulgarian Mining (NBM), a wholly owned subsidiary of Navan (Mining Journal, 1996). Homestake had acquired this option in 1995 through the purchase of 6 million shares of Navan for US$24 million. Originally, NBM formed a joint venture with Chelopech (Bimak) to mine copper and gold in Bulgaria. NBM's share in the joint venture's equity amounted to 68% (Metal Bulletin, 1996). The need for rapid environmental improvement at Chelopech, provided Navan with the original investment opportunities in the operation. Owing to the high pollution of the Topolnitz tailings dam with arsenic in 1990, the Environmental Law of 1991 forced the Government of Bulgaria to prohibit the processing of Chelopech ore at MDK (Pirdop) because copper concentrate produced at this facility contained as much as 0.75 As. With output down to about one-fifth of capacity, Chelopech established a joint venture with Navan (Bimac-AD) that would introduce new technology at this operation (Kraicheva, 1996).

In 1997, Navan and Homestake conducted discussions with the Government of Bulgaria, involving the full privatization of the Chelopech operation, the expansion of the mine's production, and obtaining mineral concessions. The companies viewed Chelopech as a "long-term competitive producer of copper and gold" (Skillings Mining Review, 1997). Planned facility expansion at Chelopech would raise production of copper to about 18,000 t/yr and gold to about 5,000 kilograms per year (kg/yr) (Homestake Mining Company, 1997; Skillings Mining Review, 1997). During the January- to September period in 1997, production at Chelopech amounted to a 28% rise in copper production, from 3,601 to 4,606 t. Output of gold increased by 1.6% from 1,268 kilograms (kg) (40,764 ounces) in 1996 to 1,288 kg (41,396 ounces) in 1997 during the same 9-month period (Mining Journal, 1997b).

The Chelopech mining operation worked a polymetallic deposit that, apart from gold, contains commercially useful values of germanium, iridium, palladium, and silver. Reserves at Chelopech were calculated on the basis of a cutoff grade of 5 grams per ton (g/t) of gold, and were estimated to be about 7 million ounces (about 218 t) of gold. At a cutoff grade of 3 g/t, reserves of gold were determined to be 14 million ounces (about 435 t) (Mining Journal, 1997c).

The Chelopech mine and beneficiation plant had the capacity to treat 750,000 t/yr of ore. Facility modernization included entire new complements of flotation cells, pumps, instrumentation, and electrical switchgear. Copper-gold concentrate, a product of primary flotation, accounted for 80% of the copper and 57% of the gold recovered. The residual pulp was acidified to produce pyrite concentrate containing 25% to 30% gold. The main environmental problem rested with the copper-gold concentrate, which contained from 4% to 5% as, by weight. To avoid a large smelter penalty and/or closure, an 85,000-t/yr roaster plant to remove the arsenic was purchased from Outokumpu Oy of Finland. Because the gold contained in the pyrite concentrate is refractory (i.e., requiring a high temperature to process), small amounts were sold locally (15,000 to 20,000 t/yr). Because of Navan's acquisition of Almagera S.A. in Spain's pyrite belt, the Chelopech pyrite concentrates have begun to be processed at Almagere. Deliveries to Almagere from June through year-end amounted to 35,000 t.

Modernization at the Chelopech mine included the acquisition of Toro 300 and 301D scoops, a Tamrock mininmatic drill carriage and a Solo drill rig, and a variety of utility vehicles. New garage facilities also were completed at the 405-meter (m) level for maintenance of the new diesel fleet. Electrical switchgear and compressed air systems were extensively renovated and replaced. The results of a study conducted at Chelopech to extend the depth of the mine was as follows: (1) A 20-square-meter (m^2) ramp would have to be constructed from the surface to the 405-m level to provide access to the main garage complex and would free the Kapitalna shaft for rock hoisting, (2) the conversion of the Kapitalna shaft to skip hoisting from wagon haulage would require redesigning the shaft and lengthening it by 185 m to enable the installation of a loading pocket, and (3) material from below the 405-m level should be moved to a new in shaft primary crusher on the 255-m level and the levels would be connected by a ramp system. Also, to meet the objective of increasing production to 1.5 million metric tons per year (Mt/yr), the beneficiation process should undergo modification that was to include a semiautogenous grinding mill (Mining Journal, 1997c).

Navan's exploration in the Chelopech area focused mainly on four licenced exploration areas, targeting Upper Cretaceous gold and copper mineralization. As indicated earlier, exploration at the Etropole-Iskar licence area showed promise during the year. The other licence areas included Breznick/Western Srednagora (west of Sofia, extending to the Serbian border), Golema Rakovitsa (west of Chelopech and south of Etropole-Iskar), Stara Zagora (in the center of Bulgaria), and Chelopech/Schvishti Plaz (an area immediately north of Chelopech) (Mining Journal, 1997c).

The privatization of the MDK SA Copper Smelter & Refinery (formerly the Georgi Damyanov Copper Smelter and Refinery) was among the chief events in Bulgaria's copper-gold branch. Built in 1958 as Bulgaria'a only smelting and refining complex, MDK was upgraded in 1987 when a 360,000-t/yr copper slag flotation plant, a second sulfuric acid plant, and a 120,000-t/yr Outokumpu flash smelter were added to the operation. The dissolution of Bulgaria's central economic planning system prevented the completion of a planned third sulfuric acid plant and a new 130,000-t/yr copper refinery, until 1994, when work was resumed. The difference in capacities between the flash smelter and the new refinery was accounted for by the 14,000-t/yr smelter capacity of the Eliseina copper smelter. In 1997, work on the new refinery and sulfuric acid plant continued, but scheduled completion was contingent on the availability of funds (Gill, 1997e). The cost to complete the construction of these facilities, along with technical improvements to abate pollution, was estimated to be between US$80 million and US$180 million. To help meet these needs, the Government offered 56% of MDK's stock for sale (Gill, 1997e).

In September, the Privatization Agency of Bulgaria signed an agreement with Union Minière of Belgium (UM), to sell 56% of MDK stock to UM for US$80 million. UM reported plans to invest US$200 million during a 5-year period to raise smelting capacity to 185,000 t/yr and to build the new copper refinery (Union Minière, 1997).

Foreign and domestic gold exploration and mining activities played a role in Bulgaria's gold mining sector in 1997. Domestically, Greek American Exploration Ltd., a joint venture comprising Royal Gold Inc. of Denver and Silver and Baryte Mining Co. of Athens, signed an agreement with the Phelps Dodge Exploration Corporation to form a joint venture, Sofia Minerals Ltd. (SOMIN), to explore and develop prospective properties in Bulgaria. SOMIN and Bulgaria's Committee of Geology and Mineral Resources signed an agreement giving SOMIN requisite concession to conduct exploration work at Lozen-Stremchi in southeastern Bulgaria and Buhovo-Gorna Malina, near Chelopech, in the northwestern part of the Panaguirishte intrusive zone. The Lozen-Stremchi concession was flanked by the RTZ Corp. Plc.'s exploration concession to the north and Minorco's concession to the south and covered an area of 2,645 square kilometers (km^2) (about 1,021 square miles). Buhovo-Gorna Malina is a 600-km^2 (232-square-mile) concession area bordering a large exploration concession area in the north and east held by Navan. The Buhovo-Gorna Malina exploration area is "considered to be a possible continuation of the Srednogorie volcanic intrusive corridor," thought to contain Au-Cu mineralization. SOMIN planned to allocate about US$350,000 for extensive exploration in Bulgaria during an 18-month period (Royal Gold, Inc., 1997).

The reestablishment of cooperative work between Bulgaria and Mongolia, which largely collapsed following the dissolution of CMEA, was another important issue in the gold sector during the year. The two countries reached an agreement in October to reestablish a 50%-50% gold mining venture (Mongolbulgargeo) in Mongolia. The original agreement was terminated in 1990. Talks between the two countries resumed in 1994; the agreement that was reached in 1997 specified Mongolia as the country of registration for Mongolbulgargeo to take advantage of Mongolia's more favorable taxation regime. The principals in the joint venture are state-owned entities—Bulgargeomin on the Bulgarian side and the State Property Committee representing Mongolia. The joint venture's projected output was to amount to about 300 kg/yr of gold (Reuters Limited, 1997).

Steel trade issues with the European Union (EU) dominated events in Bulgaria's steel industry in 1997. The first issue concerned the curtailment of Bulgaria's exports of steel to the EU, and, the second, the EU's demand that Bulgaria abrogate its metal scrap export restrictions. To avoid antidumping actions by the EU, Bulgarian steel producers voluntarily restricted exports to the EU. Steel exports (hot-rolled coil), which increased between 1994 and 1996, depressed prices, especially in the steel markets in Italy, Spain, and the United Kingdom (Gill, 1997a). Owing to this curtailment, more of Bulgaria's steel exports were directed to less profitable market in Asia and the United States, where competition from Russian and Ukrainian producers was very strong. With respect to claims that Bulgarian steel was dumped on the EU market, Bulgarian producers indicated that they have been paying international or higher prices for almost all inputs to production except those for labor (Gill, 1997a).

Scrap feestock was vital to the country's steel production, especially at the Stomana Iron and Steel Works. Rising exports of iron and steel scrap affected the country's output of steel negatively, and there appeared to be a direct correlation between increases in scrap exports and the decline in total output. A spokesperson for Bulgaria's steel industry indicated that provisions within the EU association agreement allow for exclusions of critical materials; that is, materials deemed to be critical for the economy. The spokesperson further noted that eliminating Bulgaria's scrap export quotas would in no way alleviate the EU's raw material need (full exports would represent only 1% of the EU's consumption requirements), but would cause serious damage to the country's steel industry and economy (Gill, 1997a).

The country's crude steel was produced principally at Kremikovtzi EAD (Corp.) and Stomana Joint Stock Co. Kremikovtzi EAD, built in 1974, was originally planned to utilize a complex iron ore, mined about 7 km from the steelworks. The levels of lead and manganese in the ore, however, were sufficient to preclude its full scale use as a feedstock. Only 20% of Kremikovtzi's 2-Mt/yr iron ore feedstock requirements could be supplied by this deposit. The balance of the ore was supplied by the former Soviet Union (FSU) mainly with ore from deposits in Russia and Ukraine (Gill, 1997d). The decline in trade between Bulgaria and the FSU following the dissolution of the U.S.S.R. necessitated importing about 1.6 Mt/yr of iron ore from Brazil, the Republic of South Africa, and Venezuela. Also, about 1.5 Mt/yr of coking coal was shipped to Bulgaria from the United States, and relatively small quantities of coal were imported from Poland (Gill, 1997d). Despite the deterioration of export sales of steel to the FSU, some traditional regional export markets remained viable, including Greece, Serbia-Montenegro, Turkey, and the former Yugoslav Republic of Macedonia. Market opportunities also have become available in the EU, as well as in Mexico and the United States.

Approximately 80% of Kremikovtzi's steelmaking capacity required input of ore and concentrate for the oxygen converters; the balance required scrap for the production of electric steel (Dimitrov, 1998). With total steel output at Kremikovtzi amounting to about 1.85 Mt in 1996, the plant's total capacity utilization during that year was 82%, a decline of 10% compared with that of 1995. Capacity utilization of oxygen converters fell to 95.5% in 1996 from 100.5% in 1995, a decline of 5%. However, the utilization of electric arc furnaces showed the steepest decline of 43% compared with 44.9% in 1996 (Georgiev-Avramov, 1998).

As of 1991, the original production profile at the Stomana Joint Stock Company included two blast, seven open-hearths, and three 100-t electric arc furnaces. By 1997, the plant produced steel from only two of its electric arc furnaces; one of the two is new, and the other is a hybrid Mannesmann/Asea unit. The steel was refined in two ladle furnaces that had been commissioned between 1994 and 1997. The completion of a third electric arc furnace was anticipated by year-end 1997. The Stomana steelworks produced low- and high-alloy steels, as well as a small range of tool steels. The company's planned future investments included modernization of its 300,000-t/yr plate mill. In addition to increasing productivity, product quality, and reducing energy inputs, rationalization and modernization at Stomana have had a salutary effect on the plant's environmental status. The closure of Stomana's open-hearth and blast furnaces produced an environmental dividend by significantly reducing emissions of pollutants at the facility. Additionally, the most recent direct expenditure on environmental protection included the acquisition of a Demag offgas filter valued at US$3 million and a water supply system redesigned to a closed loop, or cycle, process (Gill, 1997b).

Although Stomana does not produce special steels, the capacity to produce them exists at two nearby enterprises—the Radomir "Goliath" (producing heavy cranes, blast furnaces, and surface mining equipment using an electric furnace and technology supplied by Kobe Steel of Japan) and Kamet. The steelmaking furnace at the Goliath, however, has not been operational, and the Kamet declared bankruptcy and was not expected to reopen.

Future investment plans for the steel industry are shown in table 7.

The lead and zinc industry in Bulgaria was based on mining and processing operations near Plovdiv, in the Ossogovo Mountains in western Bulgaria; near the Thundza River in eastern Bulgaria; and in the Madan area, near the Greek border. Lead and zinc smelting and refining were in Plovdiv and in Kurdjali in the Madan area. (*See table 8*).

KCM SA (KCM), the lead and zinc smelting and refining operation in the Plovdiv region, imported 70% of the lead concentrates and 40% of the zinc concentrates used in the operation. Additionally, 4% to 5% of the refined lead, as well as 20% of the zinc, was produced annually at KCM from secondary sources. In 1996, KCM produced 55,000 t of London Metal Exchange (LME)-grade zinc and 40,000 t of LME-grade lead. KCM was established to process lead and zinc sulfide ores located in deposits 15 to 50 km from the smelter and refinery (Gill, 1997c). Operating at about 92% of capacity in 1997, KCM increased its production of lead and zinc in recent years compared with the output for these commodities in 1993 of 32,000 and 46,700 t, respectively. In addition to lead and zinc, KCM produced byproducts consisting of about 200 t/yr of cadmium, 300 t/yr of bismuth alloy, 35 t/yr of dore, 2,500 t/yr of zinc sulfate, and 50,000 to 60,000 t/yr of sulfuric acid (Gill, 1997c). More than 80% of KCM's zinc and about 50% of the lead production was exported each year (about 20,000 t lead and 45,000 t zinc).

Major investments by KCM since 1989 were directed at reducing pollution. The lead plant was the most serious point source of pollution. Filters and other equipment used for pollution abatement were reported to have cut toxic waste by 300%, lead emissions by 250%, and cadmium and zinc emissions to legally permissible levels. The use of natural gas at the lead refinery and the Waeltz kiln plant instead of the steam power station resulted a reduction of SO_2 by 900 t/yr, and filters in the Waeltz unit and a leaching plant reduced dust emissions by 60%. A closed loop water cooling system was installed in 1993 that eliminated cadmium, lead, and zinc contamination of processed water. To finance these investments, KCM was able to obtain US$60 million credit packages from the Japanese Government. Scheduled completion of facility improvement at KCM was to be in 1999, and, according to the agreement with Japan, the company would not be privatized before the completion of the work (Gill, 1997c; Clifford, 1998). With respect to dust and waste water, the results of investments by KCM for environmental protection during the first half of the 1990's are shown in table 9 (Dobrev, 1998).

Lead and Zinc Complex Ltd. in Kurdjali produced about 30,000 t/yr of lead and 26,000 t/yr of zinc by using concentrates (70%) and industrial wastes (30%) as a feedstock; it also produced about 80 t/yr of cadmium. A 20,000-t/yr battery-recycling facility was planned for the operation; western financial institutions will provide assistance (Gill, 1997c). Lead and Zinc Complex was partially (25%) privatized in 1996. In 1997, Bulgaria's newly elected Government agreed to sell off the remaining 75% of the plant's assets. Investment capital was key to modernizing the production process and to introducing pollution-abatement technology. Bidders included German and Swiss companies (Mining Journal, 1997a).

The major events during the year in the manganese sector included shifts in mine ownership and efforts to increase the level of mining privatization.

In June, QEX-M Resources of Canada was in the process of acquiring a 60% interest in International Minerals & Metals Corp. of the United Kingdom (IMMC), whose interest in the Obrochishte manganese mine amounted to 51% of the operation's total equity. The mine is located about 35 km northwest of the port of Varna on the Black Sea. Reserves were estimated to be more than 80 Mt of ore, averaging about 28% manganese. Production under IMMC's management has been about 150,000 t/yr of ore to produce 80,000 t/yr of concentrate. Also, IMMC was interested in increasing its share in the Obrochishte operation to 91% through stock purchases from the Government and raising overall production capacity to 500,000 t/yr of ore to produce 260,000 t/yr of concentrate. To raise production capacity, IMMC planned to construct a second larger shaft, the construction of which was put in abeyance during the dissolution of the central economic planning system. Also, a new sinter plant was to be imported from Canada to raise the manganese content of the concentrate from 33% to 48% (Cumming, 1997).

"Bentonit"-EAD, founded in 1951 and formerly known as the Rhodopi mining complex, was one of Bulgaria's main producers of industrial minerals. Originally, the company produced only asbestos and mica. In subsequent years, it began to produce other industrial minerals, including chalk and talc. In 1997, bentonite, perlite, and zeolite were mined and processed into products of various grades that were suitable for domestic consumption and exports (Zhilov, 1998).

Holderbank Financière Glaris Ltd. of Switzerland acquired a majority shareholding (51%) in Beloizvorski Cement JD Co. of Bulgaria, a former state-owned company, for US$32.5 million. Such issues as concession rights for operating adjacent quarries also were discussed during the year (Industrial Minerals, 1998a). Located near the village of Beli Izvor in the Vratza municipal region, Beloizvorski Cement JD Co. uses locally quarried limestone and marl to produce M350 and M450 grades of cement. The plant had the capacity to produce 900,000 t/yr of cement by using 1 Polizius and 2 Sket production lines. The number of personnel prior to the sale totaled 1,260 workers and administrative staff. About 80% of the company's output has been sold on the domestic market.

Having reached a preliminary agreement in 1996 with the Government of Bulgaria to purchase Sodi S.P.J.S. Co., the country's producer of soda ash, Solvay S.A. of Belgium finalized the deal in mid-1997 to acquire 60% of Sodi's stock for US$160 million. Solvay also announced plans to invest about US$25 million to double Sodi's dense soda ash capacity from 400,000 to

800,000 t/yr and to improve storage capacity at the plant with the addition of a 18,000-t silo. Solvay also announced that it no longer would support a renewal of duties on soda ash to the EU (Industrial Minerals, 1998b).

To restructure the coal industry, the Government prepared a major two-part development plan (Markov, 1996). The short-term portion covers the period 1995 to 2010 and the long-term portion covers 1995 to 2020. The short-term plan calls for coal output to reach 35 Mt by 2000 at the same time the coal industry is to undergo reorientation to meet consumer demand and corporate restructuring. The long-term plan calls for domestically mined steam coal to account for 36% to 40% of the total electric power generated in the country. Most of the coal would be mined at the East Maritsa open pit mine, which should be sufficient to generate 16 billion kilowatts per year and to allow for the expansion of thermal electric power station capacities and the needs of the briquet plant in the region. Production of coal from the Bobov Dol open pit mines was to be maintained to produce 1.85 Mt/yr of coal to supply the rebuilt Bobov Dol thermal electric power station (3 billion kilowatts). The long-term plan also requires the stabilization of production at the western Marishki coalfield to supply supply the Maritsa-3 electric power station. Moreover, the plan called for the continuation of state subsidies to the coal mine mining industry to maintain output and expand production capacity. The subsidies are to be implemented in with the state's investment strategy for the coal industry (Markov, 1996). Additional coal production needs could be met from deposits at Elkhovo and Balsha.

One of the major issues concerning the natural gas and petroleum sector during the year was the continuing dispute about deliveries of natural gas to Bulgaria from Russia. The dispute between Gazprom of the Russian Federation, that country's giant natural gas producer, processor, and exporter, and Bulgaria's state-owned gas industry interests rose from disagreements about the purchase price of gas, which amounted to about US$100 per thousand cubic meters, a price the Bulgarian side claimed was US$10 to US$15 higher than comparable European prices. According to Bulgarian Government spokespersons, the resolution of this issue would facilitate the implementation of an earlier Bulgarian-Russian agreement on the transit of Russian natural gas to the Balkans through Bulgaria and the construction of new pipelines (Journal of Commerce, 1997).

Bulgaria appeared to have made a substantial effort to bring about change to the country's economy and political institutions to allow its participation in such trans-European institutions as, the Central European Free Trade Area, the EU, and the Organization for Economic Cooperation and Development. Because participation in these institutions has been assured, foreign commercial activity in Bulgaria should increase, given that the trend toward change continues.

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TABLE 1
BULGARIA: TOTAL REPORTED EMISSION OF CONTAMINANTS INTO THE ATMOSPHERE 1/

(Thousand metric tons)

Contaminant	1994	1995		1996	
CO	932	832	(-11%)	623	(-25%)
CO2	72,401	72,808	(+1%)	66,074	(-9%)
NH3	25	84	(336%)	83	(-1%)
SOx	1,469	1,477	(+1%)	1,420	(-4%)
NOx	298	265	(-11%)	259	(-2%)
N2O	49	49		48	(-2%)
Dust (nontoxic)	248	206	(-17%)	169	(-18%)
Methane	534	507	(-5%)	501	(-1%)
Nonmethane volatiles	393	351	(-11%)	309	(-12%)
Aggregated emissions	76,349	76,579	(+.3%)	69,486	(-9%)

1/ Percentage chnges are provided for the years 1995 and 1996.

Source: Natsionalen Statisticheski Institut, 1997, Statisticheski Godishnik: Natsionalen Statisticheski Institut Sofia, p. 25.

TABLE 2
BULGARIA: EXPENDITURES ON ENVIRONMENTAL PROTECTION AND RECLAMATION

Year	Total expenditure (million constant lev)	1993-96 percentage change
1996	18,160	(+233)
1995	7,789	(+47)
1994	5,308	(+40)
1993	3,801	(+53)
1992	2,478	

Source: Natsionalen Statisticheski Institute, 1997, Statisticheski Godishnik: Natsionalen Statisticheski Institute, Sofia, p. 25.

TABLE 3
BULGARIA: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
METALS						
Aluminum metal, secondary		1,832	4,412	4,519	4,417 r/	4,500
Bismuth metal e/		40	40	40	40	40
Cadmium metal, smelter		265	286	250	250	280
Copper:						
Ore:						
Gross weight	thousand tons	19,700	19,000	21,050 r/	21,123	21,836 3/
Cu contente/	do.	93	75	105 r/	106	109 3/
Concentrate:						
Gross weight	do.	250	370	378 r/	444 r/	463 3/
Cu content	do.	33	74	76 r/	89 r/	93 3/
Metal, primary and secondary:						
Smelter		28,000	89,400	95,900 r/	104,398	114,630 3/
Refined		26,300	26,500	28,800 r/	22,301	34,530 3/
Gold metal	kilograms	2,000 e/	2,000 e/	3,100	3,390	1,020 3/
Iron and steel						
Iron ore:						
Gross weight e/	thousand tons	1,000	950	959	1,000	858 3/
Fe content	do.	266	268	270	282 r/	242
Iron concentrates	do.	428	462	483	497 r/	479 3/
Metal:						
Pig iron for steelmaking	do.	998	1,442 r/	1,581	1,481 r/	1,610
Ferroalloys, ferrosilicon e/	do.	20	20	8	8	10
Steel, crude	do.	1,941	2,491	2,724	2,457 r/	2,628 3/
Semimanufactures, rolled	do.	1,602	2,120	2,250	1,901 r/	2,242 3/
Lead:						
Mine output, Pb content		40,000	50,000	37,000	33,000	30,000
Concentrate:						
Gross weight		60,000	65,000	46,466	40,681	39,800 3/
Pb content		39,000	43,000	33,000	28,500	27,900 3/
Metal, refined, primary and secondary		56,994	61,950 r/	72,150 r/	74,690 r/	72,580 3/
Manganese ore:						
Gross weight		15,500	-- r/	19,000	44,270 r/	47,430 3/
Mn content		4,000	-- r/	5,600	13,100	14,000
Silver, mine output, Ag content e/		35	35	30	49 r/	32 3/
Tin, metal		23	22	13	8	10
Uranium, oxide, U content e/		600	600	600	600	600
Zinc:						
Mine output, Zn content		32,000	30,000	21,200	25,700	21,000
Concentrate:						
Gross weight		65,000 e/	54,900	49,200	38,000	38,420 3/
Zn content		30,000 e/	29,000	26,000	19,800	20,000 3/
Metal, smelter, primary and secondary		54,039	64,005	79,700 r/	68,018	70,420 3/
INDUSTRIAL MINERALS						
Asbestos		500	100	400 r/	300 r/	300
Barite		900,000 e/	950,000 e/	990,100	976,700	285,000 3/
Cement, hydraulic	thousand tons	2,007	1,910	2,070	2,137 r/	2,100
Clays:						
Bentonite	do.	67	76	126	202 r/	171 3/
Kaolin, washed	do.	111	145	168	189 r/	150
Refractory	do.	55 e/	60 e/	61	67	62 3/
Feldspar	do.	51	50	74	30	36 3/
Fluorspar e/	do.	5	5	4 3/	2 3/	2
Gypsum and anhydrite:						
Crude	do.	143	161	163	169	156 3/
Calcined	do.	54	62	64	64 r/	60

See footnotes at end of table.

TABLE 3--Continued
BULGARIA: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
INDUSTRIAL MINERALS--Continued						
Limestone and dolomite	thousand tons	10,000 e/	10,000 e/	--	10,443	10,842 3/
Lime, industrial	do.	531	665	952	991 r/	1,000
Nitrogen, N content of ammonia	do.	885	995	1,203	1,194 r/	1,200
Perlite	do.	35 e/	35 e/	33 3/	26 3/	20 3/
Pyrites, gross weight e/	do.	150	150	150	150	150
Salt, all types	do.	650	1,300	1,500	1,600	1,600 3/
Sand and gravel	thousand cubic meters	3,000 e/	3,000 e/	--	3,075	2,140 3/
Silica (quartz sand)	do.	700 e/	700 e/	707	832	557 3/
Sodium carbonate, calcined	do.	259	451	796	800	800
Sulfur: e/						
S content of pyrites		50,000	50,000	50,000	50,000	50,000
Byproduct, all sources		50,000	50,000	50,000	50,000	50,000
Total		100,000	100,000	100,000	100,000	100,000
Sulfuric acid		408,822	427,959	453,827	524,714	500,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, marketable:						
Anthracite	thousand tons	41	29	24	23	16 3/
Bituminous	do.	222	144	170	172	130 3/
Brown	do.	3,419	3,155	3,187	3,961	3,491 3/
Lignite	do.	25,351	25,429	27,449	28,101	26,929 3/
Total	do.	29,033	28,757	30,830	32,257	30,566
Coke	do.	912	1,116	1,240	1,157 r/	1,200
Gas, natural, marketed	million cubic meters	7	8	60 r/	42	38 3/
Petroleum:						
Crude, as reported	thousand tons	43	36	47 r/	34 r/	28 3/
Refinery products e/	thousand 42-gallon barrels	20,000	25,000	25,000	25,000	25,000

e/ Estimated. r/ Revised.

1/ Table includes data available through December 1998.

2/ In addition to the commodities listed, barite, chromite, fluorspar, magnesite, palladium, platinum, tellurium, uranium, and a variety of crude construction materials (common clays, sand and gravel, dimension stone, and crushed stone) are produced, but available information is inadequate to make reliable estimates of output levels.

3/ Reported figure.

TABLE 4
BULGARIA: EXPORTS OF SELECTED MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1993	1994	1995	1996 p/
METALS				
Copper, ore and concentrate	119,000	107,100	72,100	87,000
Iron and steel:				
Ore and concentrate, including roasted pyrite	23,475	--	--	--
Metal, semimanufactures, flat-rolled products of iron or nonalloy steel	545,000	819,600	1,022,400	683,200
Zinc, metal including alloys, unwrought	61,800	57,800	62,600	70,700
INDUSTRIAL MINERALS				
Cement 2/	584,200	1,149,800	1,863,700	1,824,000
Fertilizer materials, manufactured, nitrogenous	209,000	287,900	766,000	746,800
Nitrates, crude	2,900	1,000	2,300	2,400
Sodium compounds, n.e.s., soda ash, manufactured	127,500	299,100	572,700	631,200
Stone, sand and gravel, dimension stone, crude and partly worked	7,600	9,800	10,300	11,500

p/ Preliminary.

1/ Table prepared by Glenn J. Wallace.

2/ May include clinker.

Source: Republic of Bulgaria, National Statistical Institute, Statistical Yearbook, 1996.

TABLE 5
BULGARIA: SELECTED IMPORTS OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1993	1994	1995	1996 p/
METALS				
Aluminum, metal including alloys, unwrought	9,900	9,300	13,600	7,000
Iron and steel:				
Ores	878,500	819,500	1,484,300	45,800
Metal:				
Pig iron, cast iron, related materials; and steel, primary forms	17,200	42,100	48,900	14,900
Semimanufactures, tubes, pipes, fittings	57,700	23,300	24,600	22,800
INDUSTRIAL MINERALS				
Cement 2/	12,400	17,400	17,400	12,100
Fertilizer materials, manufactured:				
Phosphatic	92	5,390	338	3,597
Potassic	5,784	16,375	17,021	35,606
Phosphates, crude	237,900	275,200	267,500	437,100
Salt and brine	173,600	118,700	118,500	116,500
MINERAL FUELS AND RELATED MATERIALS				
Coal:				
Anthracite	1,671,700	1,046,700	630,900	2,006,100
Other and briquets	1,229,900	876,300	1,231,600	231,300
Coke and semicoke	92,200	750,600	146,600	178,900
Petroleum:				
Crude thousand tons	8,900	5,900	7,400	5,600
Refinery products:				
Gasoline	143,200	107,100	12,600	1,200
Distillate fuel oil	566,200	168,600	3,100	100

p/ Preliminary.

1/ Table prepared by Glenn J. Wallace.

2/ May include clinker.

Source: Republic of Bulgaria, National Statistical Institute, Statistical Yearbook, 1996.

TABLE 6
BULGARIA: CONSUMPTION OF MAJOR MINERALS 1/

(Metric tons unless otherwise specified)

Commodity	1992	1993		1994		1995		1996	
METALS									
Total iron and steel, rolled	714,915	551,719	(-33%)	549,287	(-1%)	647,431	(+23%)	620,487	(-8%)
By industry, total	586,765	460,349	(-22%)	450,907	(-2%)	597,316	(+32%)	549,525	(-8%)
Iron and steel-making branch	224,923	157,312	(-30%)	170,318	(+8%)	332,101	(+95%)	271,576	(-18%)
Machine-building and metal working branch	251,902	212,071	(-16%)	196,939	(-7%)	175,855	(-11%)	185,871	(+6%)
Other industrial branches	109,940	90,966	(-17%)	83,650	(-8%)	89,360	(+7%)	92,078	(+3%)
Total steel pipes and tubes:	58,795	84,295	(+43%)	83,912	(<-1%)	81,691	(-3%)	73,263	(-10%)
By industry, total	29,835	63,934	(+214%)	62,177	(-3%)	62,040	(<-1%)	51,580	(-17%)
Machine-building and metal working branch	15,798	51,590	(+326%)	49,613	(-4%)	44,084	(-11%)	32,472	(-16%)
Other industrial branches	14,037	12,344	(-12%)	12,564	(+2%)	17,956	(+43%)	19,108	(+6%)
Total nonferrous metals and semimanufactures	16,958	18,112	(+7%)	16,342	(-10%)	17,648	(+8%)	14,585	(-17%)
By industry, total	15,761	17,692	(+12%)	15,844	(-10%)	17,435	(+10%)	14,300	(-18%)
Machine-building and metal working branch	7,037	9,126	(+30%)	7,936	(-13%)	6,939	(-13%)	5,256	(-24%)
Electrical and electronic branch	3,772	4,208	(+12%)	3,477	(-17%)	3,779	(+9%)	3,271	(-13%)
Other industrial branches	4,952	4,358	(-12%)	4,431	(+2%)	6,717	(+52%)	5,773	(-16%)
Total cement	1,396,766	1,478,324	(+6%)	1,593,293	(+8%)	1,692,296	(+6%)	1,791,812	(+6%)
By industry, total:	242,912	268,401	(+10%)	226,740	(-16%)	345,430	(+52%)	364,922	(+6%)
Construction materials industry	223,543	243,599	(+9%)	198,671	(-18%)	307,007	(+55%)	322,496	(+5%)
Other industrial branches	19,369	24,802	(+28%)	28,069	(+13%)	38,423	(+37%)	42,426	(+10%)
By construction sector	966,756	1,109,047	(+15%)	1,202,609	(+8%)	1,145,617	(-5%)	1,314,554	(+15%)
By other sectors of the economy	187,098	100,876	(-46%)	163,944	(+63%)	201,249	(+23%)	112,336	(-47%)
ENERGY (terajoules)									
Total energy consumption	448,004	453,252	(+1%)	451,849	(<-1%)	481,359	(+7%)	481,385	(<+1%)
By industry:	212,529	204,220	(-4%)	220,846	(+8%)	250,251	(+13%)	243,261	(-3%)
Iron and steel (including mining)	38,132	41,614	(+9%)	52,625	(+26%)	59,141	(+12%)	53,628	(-9%)
Nonferrous metals (including mining)	11,800	12,517	(+6%)	12,619	(+1%)	13,568	(+8%)	13,824	(+2%)
Construction materials	21,153	21,391	(+1%)	24,075	(+13%)	28.502	(+18%)	27,428	(-4%)
Petroleum refining and chemicals	64,470	62,621	(-3%)	69,737	(+11%)	86,243	(+24%)	85,621	(<-1%)
Other sectors of the economy	235,475	249,032	(+6%)	231,003	(-7%)	231,108	(<+1%)	238,124	(+3%)

1/ Percentage changes are included for the 1993 to 1996 period.

Source: Natsionalen Statisticheski Institut, 1997, Statisticheski Godishnik: Natsionalen Statisticheski Institut, Sofia, p. 151 and 157.

TABLE 7
BULGARIA: PLANNED INVESTMENT IN THE STEEL INDUSTRY

(Million dollars)

	Investments	
Year	For modernization of facilities and equipment	For Environmental protection
1998	50	22
1999	60	34
2000	40	28
2005	305	60
2010	200	15

Source: Georgiev-Avramov, Avram, 1998, Restrukturizatsiya stal'noy industrii Bolgarii: Tsvetnyye Metally, supplement, no. 8, p. 18-20.

TABLE 8
BULGARIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Cement	Reka Devnia	Devnia	1,825.
Do.	Zlatna Panega	Panega	1,300.
Do.	Others	Temelkovo, Dimitrovgrad, Pleven, and Beli Izvor	1,590.
Coal:			
Bitiminous	Economic Mining and Power Combine (SMEK) Balkanbass	Balkan Coal Basin in central Bulgaria, northwest of Silven	445.
Brown	G. Dimitrov	Pernik coal basin, southwest of Sofia	4,000.
Do.	Others	Bobov Dol and Pirin in western Bulgaria	3,100.
Lignite	SMEK Maritsa East	Maritsa East coal basin near Zagora	25,000.
Do.	Others	Marbas. Pernik, and Bobov Dol coal basins	5,300.
Copper (Cu):			
Concentrate, Cu content	Asarel-Medet Co.	Panagurishte, Pazardzhik District	25.
Do.	Chelopech Ltd.	Srednogorie, Sofia District	5.
Do.	Bradtze	Malko Turnovo	2.
Do.	Elatzite-Med Ltd.	Srednogorie, Sofia District	15.
Do.	Rosen	Burgas, near the Black Sea	1.
Do.	Tsar Asen	Srednogorie, Sofia District	2.
Do.	Burgaskii Mines Ltd., Zidorovo	Burgas, near the Black Sea	0.5
Metal, refined	MDK SA Copper Smelter & Refinery	Srednogorie, Sofia District	120.
Iron ore	Kremikovtsi Iron and Steel Combine	Kremikovtsi	2,000.
Lead-zinc (Pb-Zn):			
Concentrate, Pb-Zn content	Gorubso Co.	Erma Reka, Kurdjali, Laki, and Rudozem, all in Madan area near Greek border	59 Pb, 47 Zn.
Do.	Madzharovo Ltd.	Near Plovdiv	3 Pb, 2 Zn.
Do.	Ossogovo Ltd.	Ossogovo Mountains, western Bulgaria	3 Pb, 2 Zn.
Do.	Ustrem Ltd.	Near Thundza River, eastern Bulgaria	3.5 Pb, 0.8 Zn.
Metal:			
Pb, refined	KCM SA (formerlyDimitur Blagoev	Plovdiv	44
Do.	Lead and Zinc Complex Ltd).	Kurdjali	60.
Zn, smelter	KCM SA	Plovdiv	60.
Do.	do.	Kurdjali	30.
Manganese ore	Mangan Ltd. (Obrotchishte)	Varna District	50.
Natural gas	Ministry of Power Supply	Chiren field, in northwest Bulgaria	(1/).
Petroleum:			
Crude	do.	do.	(1/).
Refined barrels per day	Economic Trust for Petroleum Products	Refineries in Burgas, Pleven, and Ruse	260,000.
Steel, crude:	Kremikovtsi Iron and Steel Works	Near Sofia	2,300
Do.	Stomana Joint] Stock Company	Pernik	1,300.

1/ Insignificant capacity.

TABLE 9
EFFLUENT AND PARTICULATE DISCHARGES AT THE KCM SA LEAD AND ZINC SMELTER AND REFINERY

(Metric tons per year, unless otherwise specified)

Discharges	1990	1991	1992	1993	1994	1995
Dust	162	105	72	66	53	41
Waste water, discharge rate (liters per second) of which:	640	640	348	200	200	200
Zinc	720	680	216	36	37	35
Lead	46	46	17	11	5	6
Cadmium	6	5	1	0.7	0.7	0.7

Source: Dobrev, N., 1998, Kombinat tsvetnykh metallov g. Plovdiv KCM-S.A.: Tsvetnyye Metalli (supplement), no. 8, p. 18-20.

THE MINERAL INDUSTRY OF

CROATIA

By Walter G. Steblez

Following the cessation of hostilities in the former Yugoslavia, including parts of Croatia, at yearend 1995, the country began to implement fully a program of economic recovery. Until 1991, Croatia had been the chief producer of natural gas and petroleum and a leading producer of iron and steel and industrial minerals (bentonite, cement, and gypsum) in the former Yugoslavia. From mid-1991 to early 1992, the country was actively involved in a military struggle for independence, which severely damaged its infrastructure. Croatia's minerals industry suffered extensive damage in the aluminum, petroleum, and steel sector enterprises. Additionally, Croatia's routine commercial activities within the former Yugoslavia were disrupted, which led to shortages of needed raw materials.

From 1992 to 1995, the Government's major efforts were to maintain Croatia's independence and a socially acceptable level of employment. To this end, an economic stabilization program was established in 1993 (Financial Times, 1996).

In 1996 and 1997, the restructuring and denationalization of the country's major enterprises emerged as major issues of concern to the Government. Compared with levels in 1997, Croatia's gross domestic product growth rate was expected to reach 6% compared with that of 1996. Industrial production increased by 6.8% during the same period, and the value of exports grew by 3.8% (U.S. Embassy, Zagreb, Croatia, 1998b). Mineral production, which declined sharply following the dissolution of Yugoslavia, stabilized during 1996-97 and appeared to be poised to make a recovery in tandem with the country's reconstruction program. *(See table 1.)*

The Ministry of the Economy has been directing efforts to accelerate the restructuring of Croatia's industry. Of the 2,750 small- to mid-sized enterprises that were selected for denationalization in 1991, 2,324 enterprises were denationalized by 1997. Large-scale utilities and major producers of mineral fuels, however, were still entirely controlled by the Government, as were most enterprises in the minerals industry. *(See table 2.)* To increase exports, administrative fees were reduced, as were tariffs on raw materials and equipment that were not produced in Croatia (U.S. Embassy, Zagreb, Croatia, 1998b). The former domestic market of Yugoslavia was an important element in Croatia's mineral trade. With the dissolution of Yugoslavia, commerce with Croatia's former domestic trading partners was classified as foreign trade. Owing to the conflict and attendant international trade embargoes placed on several of these trading partners between 1992 and 1995, Croatia has sought to orient its trade to a greater degree toward markets in Western Europe. In 1996, the principal trading partners were Italy, accounting for 21% and 18.2% of total exports and imports, respectively; Germany, 18.6% and 20.6%; Slovenia, 13.5% and 9.9%; and Austria, 4.4% and 7.7%.

Boris Kidric Tvornica Lakih Metala at Sibenik, Croatia's aluminum smelter; the Jardral Alumina Plant at Obrovac; and Top-Tvornica Olovni I Aluminjskih Proizvoda in Zagreb (semimanufactures producer) comprised the country's aluminum industry. Before the war damaged the Boris Kidric aluminum smelter, it produced about 24% of the former Yugoslavia's total aluminum production. Aluminum production in 1997 was only about 47% of the 74,037 metric tons (t) produced in 1990.

Croatia's steel industry also was severely damaged, especially by Zeljezare Sisak d.d. in the central part of the country and Jadranska Zeljezara at Split on the Dalmatian coast. In 1990, the production of crude steel from both enterprises amounted to 423,533 t. Production of crude steel in 1997 was about 45,000 t, which was about a 90% decrease from that of 1990. In 1996, Croatia's steel exports comprised small shipments to Bosnia and Herzegovina, Macedonia, and Slovenia, as well as to France, Germany, Italy, the United States, and several countries in the Middle East.

Croatia produced sufficient quantities of cement, clays, lime, nitrogen, pumice, stone, and other industrial minerals. The demand for industrial minerals by Croatia's building materials producers and construction industry was expected to increase because of postwar reconstruction requirements and the rationalization of the country's economy and infrastructure.

In 1997, Croatia's cement industry consisted of eight plants with capacities to produce about 2.7 million metric tons per year (Mt/yr) of clinker and 2.1 Mt/yr of cement (Cembureau, 1996). Recent facility modernization at these plants was a necessary component of the country's postwar reconstruction of infrastructure (International Cement Review, 1996). German and Swiss companies were major foreign investors in the Dalmacija and the Koromacno cement companies in 1996.

According to spokespersons for the Croatian Cement Association, cement consumption in 1997 was expected to rise by 17%, or 1.55 million metric tons (Mt) compared with that of 1996. Demand for cement in the public works and the residential markets was expected to grow, with about 5% of Croatia's gross domestic product involved in financing restoration and infrastructure development. Also, according to the Croatian Cement Association, 500 kilometers (km) of highways were to have been constructed in 1997 (Rock Products, 1997).

The natural gas and petroleum industry apparently did not suffer sustained damage during the fighting in 1991-92. The production of natural gas and petroleum has continued at somewhat lower levels of output; in 1997, Croatia's output of petroleum was about 25% less than that of 1990. Domestic production of natural gas and petroleum was sufficient to meet only one-half of the country's needs for these fuels. INA d.d., Croatia's largest state-owned and operated corporation, was responsible for all domestic oil and gas production, as well as research, survey, and exploration work in this field (Cromwell, 1997). Following restructuring Phases I and II, which comprised legal and organizational changes to INA, respectively, Phase III, initiated in 1997, covered the company's financial and business restructuring. Shares of ancillary businesses that were owned and operated by INA, such as insurance companies, hotels, banks, and airlines, were to be transferred to the State Agency for the Rehabilitation of Banks, a separate Government agency. INA would retain only those activities pertinent to its main functions—exploration for and production of natural gas and petroleum, as well as their refining, processing, and marketing. This Agency also was to assume the servicing of foreign loans obtained for the construction of petrochemical facilities at Kutina and Omisalj (U.S. Embassy, Zagreb, Croatia, 1997). In 1997, INA reported a profit of about $63 million. The company's plans included a pilot operation that would franchise between 80 and 100 gas stations through open bidding and the sale of shares on the London Stock Exchange in mid-1999 (U.S. Embassy, Zagreb, Croatia, 1998c).

INA's domestic exploration program for 1996-97 included 16 test wells in 1996 and 10 wells in 1997. Only 4 of the 16 wells drilled in 1996 found petroleum or natural gas compared with 7 out of 16 wells drilled in 1995. The results for 1997 were to be announced in 1998. Additionally, INA allocated $15 million for exploration in the northern Adriatic gas fields that the company is exploiting with Agip of Italy (World Oil, 1997).

INA's foreign commercial activities included oil and gas exploration in Albania, Libya, and Russia (Siberia). INA's exploration work in Libya has been conducted since 1996. Late in the year, petroleum was discovered at the Zagreb 1 offshore oil rig in Libyan waters. Initially, the deposit's reserves were estimated to contain 12 Mt of petroleum valued at $1.6 billion. Further exploration in 1998 could help determine whether or not the deposit's development would be profitable (U.S. Embassy, Zagreb, Croatia, 1998a). In Albania, INA signed an agreement with Albpetrol that would allow exploration of the Panaje-Vlore block. The agreement called for INA to spend about $4 million during a 4-year period. In the case of an oil and gas discovery, INA would provide 75% of the cost to develop the deposit, and Albpetrol would contribute 25% (World Oil, 1997).

INA also planned to build a petroleum pipeline extending from the Adriatic coast to Hungary. The proposed pipeline would link with Russia's Druzhba pipeline, forming a bidirectional line that would carry 32 Mt/yr of petroleum (Cromwell, 1997).

Croatia's inland system of ways and communications comprised 29,621 km of railroads, highways, and inland waterways. The railroad system consisted of 2,698 km of 1.435-gauge track, of which about 930 km was electrified. The highway and road system totaled 26,929 km, of which 21,947 km was paved and 4,982 km was unpaved. The country's merchant marine fleet consisted of 56 ships totaling 645,328 deadweight tons. Pipelines for crude petroleum were 670 km in length, and those for refinery products and natural gas were 310 km and 20 km, respectively.

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TABLE 1
CROATIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/		1993	1994	1995	1996	1997
METALS						
Aluminum:						
Bauxite e/		1,690	1,400	1,500	--	-- e/
Metal, ingot, primary and secondary		25,956	25,993	30,944	32,959 r/	17,800
Iron and steel, metal:						
Ferroalloys:						
Ferrochromium		27,336 r/	31,704 r/	26,081 r/	10,559 r/	24,231
Ferromanganese e/		10,000	562 r/ 3/	--	--	-- e/
Ferrosilicomanganese		40,000	22,071 r/	-- r/	--	--
Steel, crude, from electric furnaces		73,815 r/	63,357 r/	45,373 r/	45,752 r/	68,733 3/
Silver	kilograms	500 e/	637 r/	75 r/	--	-- e/
INDUSTRIAL MINERALS						
Barite concentrate e/		1,500	-- r/	-- r/	--	-- e/
Cement	thousand tons	1,683	2,055 r/	1,708 r/	1,842,280 r/	2,133,859
Clays: e/						
Bentonite		10,000	10,391 r/ 3/	7,327 r/ 3/	9,728 3/	7,331
Ceramic clay		10,000	10,000	10,000	10,000	10,000 e/
Fire clay, crude		30,000	4,143 r/ 3/	2,475 r/ 3/	5,000	5,000 e/
Gypsum:						
Crude		20,000 e/ r/	-- r/	-- r/	86,060 r/	102,470
Calcined		7,000 e/	-- r/	-- r/	--	1,260
Lime	thousand tons	156	169 r/	81 r/	192 r/	208
Nitrogen, N content of ammonia	do.	345	311 r/	310 r/	307 r/	331
Pumice and related materials, volcanic tu	do.	300 r/	53 r/	39 r/	64 r/	63
Quartz, quartzite, glass sand		23,344	31,031 r/	31,765 r/	43,508 r/	97,563
Salt, all sources		29,643	21,655 r/	21,784 r/	18,820 r/	16,620
Sand and gravel, excluding glass sand	thousand cubic meters	2,000 e/	1,845 r/	1,925 r/	1,401 r/	3,853
Stone, excluding quartz and quartzite, dimension stone, crude:						
Ornamental	square meters	1,133,873	1,111,271 r/	1,108,655 r/	1,029,437 r/	1,130,728
Crushed and brown, n.e.s.	thousand cubic meters	4,160	4,955 r/	5,492 r/	9,099 r/	10,520
Other e/	cubic meters	20,000	20,000	20,000	20,000	20,000 e/
Sulfur, byproduct of petroleum e/		2,000	-- r/	-- r/	--	-- e/
MINERAL FUELS AND RELATED MATERIALS						
Carbon black		17,123	21,468 r/	27,187 r/	26,735 r/	24,214
Coal, bituminous	thousand tons	105	96 r/	75 r/	64 r/	49
Coke	do.	421	219 r/	-- r/	--	-- e/
Natural gas, gross production	million cubic meters	2,068	1,792 r/	1,966 r/	1,786 r/	1,717
Petroleum, crude:						
As reported	thousand tons	1,729	1,576 r/	1,500 r/	1,469 r/	1,171,015
Converted e/	thousand 42-gallon barrels	12,800	12,000	12,000	11,000	12,000
Refinery products e/		7,000,000	7,000,000	5,000,000	4,731,974 3/	5,056,289

e/ Estimated. r/ Revised.

1/ Table includes data available through April 1998.

2/ In addition to commodities listed, common clay also was produced, but available information was inadequate to make reliable estimates of output levels.

3/ Reported figure.

TABLE 2
CROATIA: STRUCTURE OF THE MINERALS INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Alumina		Jadral, Jadranski Aluminijum	Jadral Alumina Plant	150
Aluminum		Boris Kidric Tvornica Lakih Metala	Smelter at Sibenik, Croatia	75
Do.		Top-Tvornica Olovni i Aluminjskikh	Semimanufactures producer at Savska	n/a
Bauxite		Jadral, Jadranski Aluminijum	Mines in at Obrovac, Drnis, and other locations	450
Coal, Bituminous		Istarski Ugljenokopi Rasa	Mines at Labin and Potpican.	500
Cement		Dalmacija Cement	Sv. Jurai plant at Kastel Sucurac	1,300
Do.		do.	Sv. Kajo plant at Solin	750
Do.		do.	Majdan plant at Solin Majdan	780
Do.		Istra Cement International D.D.	Plant at Pula	70
Do.		Tvornica Cementa Koromacno	Plant at Koromacno	420
Do.		Tvornica Cementa Umag D.D.	Cement plant at Umag	480
Do.		Nasicecement D.D.	Nacise plant at Tajnovac	840
Natural gas	million cubic feet	do.	Natural gasfields in Bogsic Lug, Molve, and others	70,000
Petroleum:			Oil fields in Croatia and Slovenia:	
Crude	thousand barrels per day	Industrija Nafte (INA)	Benicanci, Zutica, Struzec, Ivanic Grad, Lendava, and others locations	70
Do.	do.	do.	Refineries at Urinj and Rijeka	160
Do.	do.	do.	Refinery at Sisak	150
Pig iron		Metalurski Kombinat Zeljezara Sisak	2 blast furnaces at Sisak	235
Salt	cubic meters	Solana Pag, Solana Ante Festin	Marine salt: Pag Island	13
Steel, crude		SP MK Zeljezare Sisak	Plant at Sisak	401
Do.		Jadranska Zelejzara Split	Plant at Split	120

THE MINERAL INDUSTRY OF

CZECH REPUBLIC

By Walter G. Steblez

The Czech Republic was an important Central European producer of heavy industrial goods in the toolmaking, machine building, and chemical sectors of industry. Regionally important mineral industries included steelmaking and industrial minerals, as well as construction materials production.

The growth rate of the country's gross domestic product in 1997 increased by 1% compared with that of 1996. Industrial production during the same period rose by 6.1%. Exports of goods (in terms of constant value) rose by more than 15% in 1997 compared with those of 1996. Imports during this period increased by about 9.3%. Foreign investment in the country's iron and steel sector was among the major industry events during the year (Sujan and Sujanova, 1998).

The Government of the Czech Republic continued economic development policies the aim of which has been to integrate the country into the European Union (EU). The country's memberships in the World Bank for Reconstruction and Development, the International Monetary Fund, and the Organization for Economic Cooperation and Development (OECD), as well as the World Trade Organization and participation in the General Agreement on Tariffs and Trade were largely the result of the Czech Republic's full orientation to a Western European political system and market economy. Collectively, these policies also have resulted in increased foreign investment in the Czech economy, which, in 1997, amounted to $1.3 billion, a 6% increase compared with that of 1996. According to Piskova (1998), 4 cement plants and Ceska rafinerska Praha a.s. (petroleum refinery) were reported to be among the 15 largest foreign investment projects in the Czech Republic through December 31, 1997.

Three constituent acts compose the country's mining law—Act no. 44/1988 Coll., on Protection and Use of Mineral Resources (the Mining Act), as amended; the Czech National Council Act No. 61/1988 Coll., on Mining Activity, Explosives, and State Mining Administration (Authority/Sedenka), as amended; and the Czech National Council Act no. 62/1988 Coll., on Geological Works, as amended. The Mining Act classifies minerals into two categories—"reserved" and "unreserved." Apart from market considerations, "reserved" mineral deposits were determined to be necessary for the development of the national economy. "Unreserved" deposits, in contrast, lack commercial and/or strategic values (Luks, 1997). Other provisions in the mining law address issues of licensing and federal and regional compliance with environmental regulations during the exploration and exploitation of a mineral deposit.

To meet the needs of a developing market economy, major changes in the Czech Republic's environmental policies were promulgated in 1997. On the basis of environmental principles that were approved by the Government in 1995, the new policy was officially formulated in the environmental law of 1997, Act No. 125 1997. Also, four of the six underlying provisions of the new law were formally adopted at the same time as the new law on January 1, 1998. The new environmental law focused on reducing the volume of waste, discreet collection of waste by category, and recycling. The law has adopted the main provisions in EU and OECD regulations, as well as those of the Basel Convention. The new catalog of wastes is compatible with the European Catalogue of Wastes of the EU. Substances on the Government's red list can be imported only with the approval of the Ministry of the Environment. The four principal provisions are as follows (Mikulova, 1998):

- Ministry of the Environment Decree No. 338/97 of December 11, 1997, addresses issues pertaining to waste management. The decree stipulates terms and conditions for reducing landfilling waste charges, and requiring the maintenance of records and also sets limits for contained lead, cadmium, mercury, and chromium.
- Ministry of the Environment Decree No. 337/97 of December 11, 1997, contains the waste classification catalogue. The catalogue includes 668 types of classified waste, which are separated by N (hazardous) and O (other) designations. Codes for certain types of waste accord with those in Annexes I and II of the Basel Convention, as well as with those of the OECD. Also a list of hazardous wastes under a special regime includes 14 types of wastes that pose a serious environmental threat.
- Ministry of the Environment Decree No. 339/97 of December 11, 1997, deals with the evaluation of dangerous properties in waste. These include explosiveness, flammability, inclination to oxidize, thermal instability of organic peroxides, and inclination to release toxic gases when exposed to air or water.
- Ministry of the Environment Decree No. 340/97 of December 11, 1997, concerns terms and conditions for the operation of landfills —their clearance, closure, and reclamation, as well as requirements for opening new facilities.

In 1997, the output of most metals generally fell within the range of 1996 production. The Czech Republic met almost all its requirements for metals through imports of ores and concentrates and scrap and waste recycling. The iron and steel branch continued to play a dominant role in the country's metals sector. The production of pig iron, crude steel, and steel semimanufactures, compared with that of 1996, showed increases of about 6%, 4%, and 7%, respectively. In the industrial minerals sector, bentonite, diatomite, feldspar, and quartz registered increases of 86%, 20%, 15%, and 325%, respectively. During the same period, however, the production of cement, graphite, gypsum, nitrogen in ammonia, and sand and gravel for construction use declined by 3%, 17%, 46%, 18%, and 18%, respectively. The yearend results for mineral fuels also were mixed. Bituminous and brown coal (including lignite) each declined by about 4% compared with their respective production levels in 1996. The production of natural gas declined by 19%, and that of crude petroleum showed an increase of about 3%.

The latest available foreign trade returns were for 1996 and 1995. Although the trade patterns of the Czech Republic have become greatly diversified in the ferrous metals sector since 1991, Russia and Ukraine continued to be the country's major suppliers of iron ore and concentrate. In 1996, Czech receipts of Russian and Ukrainian iron ore and concentrate accounted for 27% and 68%, respectively, of total imports. Also, Czech receipts of manganese ore and concentrate from Ukraine amounted to 82% of total imports.

With respect to nonferrous metals, Poland and Russia were the major suppliers of copper to Czech industry in 1996, accounting for about 27% and 32%, respectively, of total imports. Poland also accounted for 59% of the Czech Republic's import of zinc in 1996.

The Czech Republic conducted major import and export operations in the mineral fuels sector. In terms of volume, imports of bituminous coal amounted to more than 3.2 million metric tons (Mt). Exports, however, amounted to more than twice that amount. The major receivers of Czech bituminous and brown coal and coke in 1996 were Austria, Germany, and Slovakia. Russia continued to provide the Czech Republic with nearly all its needs for natural gas and petroleum, which, in 1996, accounted for 95% and 93%, respectively, of total imports.

The Czech Republic's metals sector produced a broad range of base metals and their semimanufactures from imported primary raw materials (ores and concentrates) and secondary materials (scrap). The metals sector represented approximately 10% of the value of the country's industrial production. The iron and steel branch alone generated between 8% and 9% of the industrial output. Employment in the metals sector generally accounts for 10% of the total employment in industry; employment in the iron and steel sector accounted for about 8% of the Czech Republic's industrial workforce. Material costs composed 60% of total production costs of the metals sector; labor costs composed 12% (Ambroz, 1997).

The iron and steel branch accounts for more than 75% of the sales of the country's metals sector and comprised 12 enterprises producing pig iron; crude steel; rolled materials; steel and cast iron pipes, including closed welded pipes; and various welded semimanufactures. The nonferrous metals branch comprised nine enterprises producing finished and semifinished commodities of aluminum, copper, and lead and their alloys. The nonferrous metals branch relied entirely on domestic and imported scrap and on imports of semimanufactured products as its raw materials base. Overall, scrap accounted for 40% to 50% of the country's total metal production. Employment in the metals sector (1995 data) amounted almost 128,000 employees (Urban, 1998).

Denationalization continued to be a hallmark of the metals sector in 1997. In the iron and steel branch, the coupon method of distributing state-owned assets was widely used. In this method, stock ownership coupons are distributed to the population on a per capita basis. The assets of KZ Beroun a.s. and ZDB Bohumin a.s. were fully privatized by the coupon method and subsequently became consolidated in large investment funds. A partial coupon method of privatization, or distribution of state-owned assets, was used at the steel mills of Zelezarny Veseli a.s., Zelezarny Hradek u Rokycan a.s., Vakcovny trub Chomutov a.s., and Trinecke zelezarny a.s. The shares of these steel companies that were not distributed by the coupon method were sold directly in a tender offered by the National Property Fund. Poldi United Steel Works in Kladno was denationalized through a tender that offered the majority of the enterprise's stock for open bidding. Nova Hut s.p. and Vitcovice a.s. underwent restructuring and modernization while under full state ownership. A portion of their stock was to be sold to new semiprivate managing companies that were to be included in the enterprises' existing management. Valcovny plechu Frydek-Mistek and Zelezarny Chomutov s.p. were being prepared for privatization during the year (Urban, 1998). By 1997, most of the enterprises in the nonferrous branch had been denationalized. The country's nonferrous metals industry produced a broad range of products principally consisting of aluminum, copper, lead, nickel, noble metals, tin, and zinc. Also, the branch's 10 major enterprises produce more than 90% of the country's output of nonferrous metals. (*See table 2.*)

The Czech Republic's foreign commercial activity has come to favor heavily countries in the EU with respect to exports and imports of iron and steel products, as well as nonmetallic minerals. In 1996, the EU accounted for 37.6% and 36.2% of the Czech Republic's total exports and imports, respectively. Slovakia was the second largest metals trade partner and accounted for 17.2% and 49.4% of the Czech Republic's total metal exports and imports, respectively.

The iron and steel industry played a key economic role, providing steel for the Czech Republic's considerable downstream machine building and metalworking industries.

The process of modernization and restructuring within this sector continued as Nova Hut s.p., one of the country's major producers of steel, obtained a loan, valued at $250 million, from the International Finance Corporation. The loan was part of the total project cost of $650 million to modernize fully the Nova Hut steelworks. About 13% of the investment was earmarked for improving environmental protection to bring the enterprise into compliance with the Czech Republic's clean air regulations, as well as with the environmental guidelines of the World Bank for Reconstruction and Development. The modernization of Nova Hut, which was in the process of being denationalized, will include increased operational efficiency, as well as a reduction of capacity by 1 Mt (Journal of Commerce, 1997). The construction of a minimill, valued at $260 million, composed the principal element in Nova Hut's investment program. IFC Kaiser International, Inc., of the United States won a contract to build the new facility on a "lump sum" turnkey basis (Reuters Limited, 1997). The first stage of the project, completed in November, included the construction of a 205-metric-ton ladle facility and a 100- to 150-millimeter single-strand caster with capacity to produce 800,000 metric tons per year of steel; the caster could be expanded to include a second strand. The second stage of construction began in June 1997 with the installation of an equalizing furnace and a hot-strip rolling mill. The company's main goal was to achieve parity of technical standards with steel producers in the EU (Metal Bulletin, 1998b).

The Poldi United Steel Works in Kladno was declared bankrupt by the Commerce Court during the early part of 1997. The court planned to sell the steel mill's assets to pay off creditors (Legge, 1997). Moravia Steel, majority owner of the Trinecke Zelezarny a.s. steelworks, was awarded a lease in early 1998 to operate the rolling mill to produce bars and strips at Poldi's rolling facility in Drin (Metal Bulletin, 1998b).

The issue of whether or not geological exploration for gold could be prevented by regional authorities following approval from the central government's certifying bodies apparently, raised in 1996, was resolved in late 1997. The Ministry of the Environment ruled against local municipal authorities in Kasperske Hory and in favor of TVX Gold Inc. of Toronto, Canada, to proceed with exploration for gold in the Kaspersk Hory region in the Sumava Mountains in the southern part of the country. Legal challenges to gold exploration in the region, however, continued from local residents and environmental groups. These challenges must be overcome if TVX is to proceed with its work. The permit, originally received in 1993, was extended to 1999. In early 1998, TVX indicated that its estimates of gold resources in Kasperske Hory were increased to 3 million ounces [about 93,000 kilograms (kg)] from 1 million ounces (31,000 kg) (Mining Journal, 1997).

Specialists from the Cement and Lime Production Association of the Czech Republic reportedly anticipated that the country's economic growth in 1997 would boost cement consumption to about 3.9 Mt. In addition, extensive repairs because of flooding in one-third of the country was another important factor for the expected increase in the consumption of cement and other construction materials. Repair of infrastructure, including commercial buildings, roads, railroads, and bridges, as well as residential facilities, could be extensive (Rock Products, 1997; Gypsum, Lime & Building Products, 1998).

Major events facing the country's cement and building materials branches, in 1998 and in later years, will center on the reduction and/or elimination of import duties on building materials (including cement) imported from the EU and in compliance with EU's ISO 9000 materials standards (Rock Products, 1997; Gypsum, Lime & Building Products, 1998).

With respect to the issue of import duties, these duties will be eliminated for many types of building materials beginning on January 1, 1998. The construction market is expected to continue growing for the foreseeable future, given the high nationwide demand for residential units, which will create a favorable market for domestic products and EU imports. There were 380 apartment units per 1,000 residents in the Czech republic, compared with about 500 per 1,000 in the EU. The issue of compliance is closely related to that concerning import duties; namely, the harmonizing of the Czech Republic's product standards with those of the EU, a process that was expected to be completed in the near future. The two issues are part of the Czech Republic's preparation for entry into the EU in 2002.

Companies in Belgium, Germany, and Switzerland have been major investors in the country's cement industry and its associated limestone and lime-producing components (Gypsum, Lime & Building Products, 1998).

In late 1997, an agreement on technical cooperation was reached between Keramost AS, the Czech Republic's leading mine producer of clays and manufacturer of ceramics, and the Stephen Schmidt Group, a major German producer of ceramic clays. The agreement called for the pooling of know-how to develop ceramic and refractory products for the Central European and the East European markets. The agreement was expected to develop into a joint venture enterprise. The Stephen Schmidt Group has been an importer of clays and blended clays from Keramost AS (Industrial Minerals, 1997).

Following a strong competitive period in 1993-94, five joint stock companies came into existence in the coal industry while smaller, less competitive mining enterprises faced closure. Ostravsko-karvinske doly Ostrava, Ceskomoravske doly Kladno, Mostecka uhelna spolecnost Most, Severoceske doly Chomutov, and Sokolovska uhelna Sokolov composed the new structure of the Czech Republic's bituminous and brown coal mining industry. The mining of lignite was continued under the auspices of Lignit Hodonin s.r.o. Contraction of the coal mining sector continued through the end of 1997. The most significant decline in coal production, however, occurred in 1995-96; a number of mines were closed, and the rise in financial assistance by the Government to the affected areas was steep. About 100,000 employees have been displaced during the coal industry's contraction, but most were able to be reemployed by the private sector, largely in enterprises with close ties to the coal sector (Doruska, 1997).

The Czech Republic's minerals sector will continue to rely heavily on imports of metal ores and concentrate and such minerals fuels as natural gas and petroleum, largely from the republics of the former Soviet Union (mainly Russia and Ukraine). Additional rationalization withing the iron and steel sector is to be expected prior to the country's entry into the EU.

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TABLE 1
CZECH REPUBLIC: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997e/
METALS						
Aluminum, secondary		30,000 e/	48,339	48,000	45,000	45,000
Copper:						
Metal:						
Refined, primary 2/		200	--	--	--	--
Refined, secondary		20,000 e/	23,323	20,000	20,000	20,000
Gold metal	kilograms	512	75	--	--	--
Iron and steel:						
Iron ore:						
Gross weight	thousand tons	-- 3/	--	36 r/	32 r/	28 3/
Fe content		--	--	10,000 e/	10,000 e/	10,000
Metal:						
Pig iron	thousand tons	4,668	5,287	5,289	4,898	5,195 3/
Ferroalloys, total electric furnace e/	do.	1	1	1	1	1
Steel, crude	do.	6,732	7,075	7,189	6,257	6,495 3/
Semimanufactures	do.	7,000	6,445	8,851	9,368	10,017 3/
Lead:						
Mine output, Pb content		100	--	--	--	--
Concentrate, gross weight		2,000	--	--	--	--
Pb content of concentrate		1,000	500	--	--	--
Metal, secondary		20,000	20,000	20,000	20,000	20,000
Silver	kilograms	500	100	--	--	--
Uranium, mine output, U content		1,018	537	611	589	624 3/
Zinc: e/						
Mine output:						
Ore (Pb-Zn), gross weight		250,000	15,000	--	--	--
Zn content of ore		1,500	100	--	--	--
Concentrate, gross weight		9,000	9,000	--	--	--
Zn content		4,000	4,000	--	--	--
Metal, secondary		1,000	1,000	1,000	1,000	1,000
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand tons	5,393	5,303	4,825	5,015 r/	4,877 3/
Clays:						
Bentonite	do.	63	65	54	59	110 3/
Kaolin	do.	2,336	2,706	2,800	2,798	2,982 3/
Other	do.	1,018	823	915	1,060	1,200 3/
Diatomite		39,000	40,000	29,000	35,000	42,000 3/
Diamond, synthetic e/	carats	5,000	5,000	5,000	5,000	5,000
Fertilizer, manufactured:						
Nitrogenous, N content		180,000 e/	234,000	264,000	252,600	250,000
Phosphatic, P2O5 content		40,000 e/	13,700	14,000	415,500	400,000
Potassic, K2O content		20,000 e/	21,900	22,000	25,000	20,000
Mixed		50,000 e/	85,000	117,000	552,300	500,000
Feldspar		203,000	170,000	183,000	211,000	243,000 3/
Fluorspar		22,000	10,000	-- 3/	--	--
Gemstones, crude, pyrope-bearing rock		34,000	33,000	24,000	39,000	49,000 3/
Graphite		27,000	25,000	27,000	30,000	25,000 3/
Gypsum and anhydrite, crude		560,000	591,000	542,000	443,000	241,000 3/
Lime, hydrated and quicklime	thousand tons	1,147	1,206	1,186	1,176	1,217 3/
Mica		--	--	3,803	--	--
Nitrogen, N content of ammonia e/		200,000	200,000	254,000 r/	304,100 r/	250,700 3/
Quartz		23,000	2,000	3,000	4,000	13,000 3/
Salt e/		180,000	180,000	180,000	180,000	100,000
Sand and gravel:						
Common sand and gravel	thousand cubic meters	12,245	11,465	10,525	12,350 r/	10,181 3/
Foundry sand	thousand tons	954	1,093	964	1,079	769 3/
Glass sand	do.	781	862	1,026	1,130	994 3/

See footnotes at end of table.

TABLE 1--Continued
CZECH REPUBLIC: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997e/
INDUSTRIAL MINERALS--Continued						
Stone:						
Basalt (for casting)		134,000	85,000	108,000	90,000	103,000 3/
Dimension stone	thousand cubic meters	187,000	225,000	210,000	190,000	200,000
Limestone and other calcareous stones	thousand tons	10,498	10,205	10,092	10,610	11,304 3/
Building Stone	thousand cubic meters	8,077	8,290	9,021	9,891	11,178 3/
Sulfur, byproducts, all sources e/		20,000	20,000	20,000	40,000 r/	40,000
Sulfuric acid e/		300,000	337,000 3/	340,000 3/	350,000	350,000
Wollastonite		--	--	800	800	-- 3/
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Bituminous	thousand tons	23,862	20,910	21,309	21,784	20,847 3/
Brown and lignite	do.	68,154	60,728	58,773	60,441	58,142 3/
Coke	do.	5,236	5,125	4,945	4,836	2,915 3/
Fuel briquets from brown coal	do.	800	499	616	600	600
Gas:						
Manufactured, all types	million cubic meters	5,000 e/	1,136	791	800	800
Natural, marketed 4/	do.	106	154	165	146	118 3/
Petroleum:						
Crude:						
As reported	thousand tons	107	131	149	155	159 3/
Converted	thousand 42-gallon barrels	550	889	1,010	1,052	1,080
Refinery products e/	do.	70,000	40,000	35,000	27,000	27,000

e/ Estimated. r/ Revised.

1/ Table includes data available through November 1998. In addition to the commodities listed, arsenic, diatomite, dolomite, illite, sodium compunds, sulfuric acid, talc, and zeolite are produced, but information is inadequate to make reliable estimates of output levels.

2/ Produced as a byproduct from noncopper ores.

3/ Reported figure.

4/ Includes gas produced from coal mines. Gross output of natural gas is not reported, but is believed to exceed reported marketed output by an inconsequential amount.

TABLE 2
THE CZECH REPUBLIC: EXPORTS OF SELECTED MINERAL COMMODITIES

(Metric tons, unless otherwise specified)

Commodity	Quantity Year 1995	1996	Major receiving countries
METALS			
Copper, Cu cont. ore and concentrate	15	163	NA.
Gold kilograms	2,329	4,693	NA.
Iron and steel:			
Rolled steel	681,000	668,000	
	194,000	190,000	Germany.
	110,000	107,000	Slovakia.
	25,000	62,000	United States.
	69,000	73,000	Slovenia.
	31,000	29,000	Austria.
	42,000	21,000	Poland.
Tubes and pipe	553,000	489,000	
	96,000	120,000	Germany.
	170,000	92,000	Slovakia.
	31,000	23,000	Austria.
	11,000	14,000	Italy.
	2,000	2,000	Hungary.
	11,000	21,000	India.
	22,000	27,000	Poland.
Steel semimanufactures	292,000	289,000	
	110,000	32,000	Germany.
	42,000	135,000	Poland.
	42,000	25,000	Croatia.
	7,000	8,000	Slovakia.
	14,000	23,000	Hungary.
	2,000	--	Austria.
Scrap	805,000	906,000	
	518,000	386000	Austria.
	69,000	300,000	Germany.
	53,000	92,000	Italy.
	101,000	76,000	Slovenia.
	55,000	34,000	Slovakia.
	7,000	10,000	Switzerland.
	--	4,000	France.
Lead	110	--	NA.
Zinc	1,800	--	NA.
INDUSTRIAL MINERALS			
Bentonite	18,048	21,633	NA.
Cement	1,463,000	1,417,000	
	1,256,000	1,206,000	Germany.
	146,000	183,000	Austria.
	60,000	23,000	Slovakia.
	--	1,000	Poland.
Clay, refractory and other	199,891	98,397	NA.
Diatomite	7,714	7,359	NA.
Feldspar	74,181	67,515	NA.
Fluorspar	26,011	17,172	NA.
Graphite	2,691	2,722	NA.
Gypsum	101,016	86,176	NA.
Limestone	72,000	88,000	NA.
Kaolin	383,498	361,858	NA.

TABLE 2--Continued
THE CZECH REPUBLIC: EXPORTS OF SELECTED MINERAL COMMODITIES

(Metric tons, unless otherwise specified)

Commodity	Quantity		Major Receiving Countries
	Year		
	1995	1996	
INDUSTRIAL MINERALS--Continued:			
Lime	169,000	199,000	NA.
	147,000	171,000	Germany.
	21,000	19,000	Austria.
	1,000	8,000	Slovakia.
Mica	2,000	40,000	NA.
Sand and Gravel:			
Sand	1,039,000	770,000	
	576,000	292,000	Germany.
	138,000	141,000	Slovakia.
	254,000	258,000	Austria.
	54,000	30,000	Slovenia.
	15,000	2,000	Poland.
Gravel	1,265,000	1,104,000	
	1,025,000	902,000	Germany.
	202,000	161,000	Austria.
	29,000	29,000	Slovakia.
	4,000	8,000	Poland.
Silica:			
Quartz	191	270	NA.
Sand, glass and foundry	661,142	692,336	NA.
Stone, dimension	266,000	188,000	NA.
MINERAL FUELS			
Coal:			
Bituminous	7,015,000	6,738,000	
	1,910,000	1,654,000	Slovakia.
	2,051,000	2,133,000	Austria.
	981,000	909,000	Hungary.
	927,000	767,000	Germany.
	1,105,000	1,200,000	Poland.
	18,000	61,000	Romania.
Brown and lignite	6,898,000	6,173,000	
	2,274,000	2,331,000	Germany.
	4,098,000	3,275,000	Slovakia.
	294,000	345,000	Hungary.
	146,000	112,000	Croatia.
	42,000	37,000	Slovenia.
Coke and semi-coke	1,406,000	1,330,000	
	415,000	373,000	Austria.
	406,000	482,000	Germany.
	172,000	179,000	Slovakia.
	141,000	101,000	Hungary.
	101,000	110,000	Finland.
	92,000	--	Belgium.
Natural gas, million cubic meters	2	1	NA.
Petroleum	108,000	8,484,000	NA.

Sources: Mineral Commodity Summaires of the Czech Republic 1997, 166 p; Statisticka Rocenka Ceske Republiky (Statistical Yearbook of the Czech Republic) 1997, 712 p.

TABLE 3
THE CZECH REPUBLIC: IMPORTS OF SELECTED MINERAL COMMODITIES

(Metric tons, unless otherwise specified)

Commodity	Quantity		Major Exporting Countries
	Year		
	1995	1996	
METALS			
Copper:			
Ore and concentrate (Cu)	15	163	NA.
Metal, refined	15,137	19,186	
	3,910	3,821	Germany.
	2,998	5,170	Poland.
	2,763	736	Slovakia.
	568	1,712	Austria.
	312	183	Netherlands.
	3,252	6,109	Russia.
	197	411	Bulgaria.
Gold (kilograms)	2,463	3,388	NA.
Iron and steel:			
Ore and concentrate	9,146,000	8,255,000	
	3,388,000	2,219,000	Russia.
	5,235,000	5,583,000	Ukraine.
	111,000	87,000	Malta.
	13,000	7,000	Switzerland.
	10,000	5,000	Poland.
	106,000	5,000	Brazil.
Pig iron	189,000	139,000	
	91,000	69,000	Slovakia.
	20,000	20,000	Norway.
	46,000	16,000	Russia.
	3,000	2,000	Germany.
	15,000	11,000	Ukraine.
	1,000	1,000	Austria.
	1,000	1,000	Switzerland
Rolled steel	712,000	779,000	
	593,000	569,000	Slovakia.
	19,000	38,000	Austria.
	33,000	81,000	Germany.
	6,000	20,000	Hungary.
	27,000	28,000	Ukraine.
	1,000	1,000	Slovenia.
	2,000	2,000	France.
Manganese, ore and concentrate	47,253	18,515	
	32,796	15,135	Ukraine.
	906	915	Netherlands.
	783	521	Greece.
	6,974	515	Slovakia.
	592	693	Australia.
Nickel	34	30	NA.
Zinc, metal	17,959	17,125	
	12,029	10,023	Poland.
	1,177	1,606	Bulgaria.
	781	612	Germany.
	1,667	2,282	Belgium.
	387	289	Slovakia.
	448	52	Austria.
	857	488	Finland.
INDUSTRIAL MINERALS			
Barite	39,964	14,692	NA.
Bentonite	3,065	5,394	NA.
Clay, refractory and other	7,001	8,513	NA.
Diatomite	7,714	7,359	NA.
Feldspar	620	3,923	NA.
Fluorspar	67,720	42,437	NA.

TABLE 3--Continued
THE CZECH REPUBLIC: IMPORTS OF SELECTED MINERAL COMMODITIES

(Metric tons, unless otherwise specified)

Commodity	Quantity		Major Exporting Countries
	Year		
	1995	1996	
INDUSTRIAL MINERALS--Continued			
Graphite	977	1,176	NA.
Gypsum	7,622	22,088	NA.
Mica	404,000	533,000	NA.
Limestone	623,000	512,000	NA.
Silica:			
Quartz	8,781	21,339	NA.
Sand, glass and foundry	159,946	127,952	NA.
Glass, sheet (square meters)	5,139,000	7,981,000	
	2,693,000	4,447,000	Germany.
	1,427,000	1,418,000	Belgium.
	60,000	18,000	France.
	12,000	5,000	Austria.
	443,000	1,343,000	Poland.
	97,000	323,000	Hungary.
Stone:			
Construction	377,000	260,000	NA.
Dimension	623,000	512,000	NA.
Sulfur	113,402	105,838	
	110,514	86,327	Poland.
	535	19,316	Germany.
	2,353	122	Slovakia.
MINERAL FUELS			
Coal:			
Bituminous	2,676,000	3,211,000	NA.
Brown and lignite	--	5,000	NA.
Natural gas, thousand cubic meters	8,049	9,500	
	8,033	9,060	Russia.
Petroleum	7,052,000	7,671,000	
	7,027,000	7,126,000	Russia.

Sources: Mineral Commodity Summaries of the Czech Republic, 1997, 166 p; Statisticka Rocenka Ceske Republiky (Statistical Yearbook of the Czech Republic), 1997, 712 p.

TABLE 4
CZECH REPUBLIC: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities 1/	Annual capacity
Bentonite	Keramost a.s.	Most	150
Cement	Bohemia, Cizkovice, Hranice, Karlov Dvor, Lochkov, Pracovice, and Velary	Bohemia	3,500
Do.	Bystre, Malomerice, Mokra, Ostrava-Kunice, and Zahorie	Moravia	2,800
Clay, koalin	Mines in Karlovy vary area	West Bohemia	450
Do.	Mines in Plzen area	Central Bohemia	150
Coal:			
Bituminous	Mines in OKD coal basin	Ostrava-Karvina, north Moravia	22,100
Do.	Mines in KD coal basin	Kladno, central Bohemia	3,000
Brown	SHD administration	Most, northwest Bohemia	61,000
Do.	HDB administration	Sokolov, west Bohemia	17,000
Lignite	JLD administration	Hodonin, south Moravia	5,000
Copper, ore	Zlate Hory	North Moravia	300
Graphite	Grafit a.s.	Netolice	35
	Rudne doly Stare Mesto-F s.r.o.	Stare Mesto	
Kaolin	Zapadoceske Kaolinove a Keramicke Zavody a.s.	Horni Briza	190
Mica	GARMICA s.r.o.	Netolice	5
Lead-zinc, ore	Horni Benesov and Zlate Hory	do.	400
Lead, metal, secondary, Refined	Kovohute Pribram	Pribram	26
Natural gas billion cubic meters	Gasfields around Hodonin	South Moravia	25
Petroleum:			
Crude	Oilfields around Hodonin	do.	140
Refinery	Kolin, Kralupy, Pardubice, and Zaluzi	Bohemia	NA
Steel, crude	Nova Hut sp (Ostrava)	Kunice-Ostrava	3,800
Do.	Zelezarne Vitkovice	Vitkovice-Ostrava	900
Do.	Trinecke Zelezarny (Trinecke Iron and Steel Works)	Trinec	3,000
Do.	Poldi United Steel Works	Kladno-Prague	1,700
Do.	Zelezarny Bila Cerkev	Hradek-Rokycany	300
Do.	Zelezarny Veseli	Veseli and Moravou	300
Do.	Zelezarny Chomutov sp	Chomutov	350
Do.	Bohumin Iron and Steel Works	Bohumin	400
Titanium dioxide	Precheza A.S	Precheza	25
Uranium	DIAMO s.p.	Straz pod Ralskem	2

NA Not available.

1/ Names and locations of mines and crude oil refineries are identical.

THE MINERAL INDUSTRY OF

DENMARK, FAROE ISLANDS, AND GREENLAND

By Harold R. Newman

Denmark's mineral resources were concentrated mainly in natural gas and petroleum fields in the North Sea that have, together with renewable energy, made Denmark a net exporter of energy since 1996. Employment in the nonfuels minerals industry (mining and quarrying, basic metal industry, etc.) accounted for about 2% of total employment.

Private ownership and exploitation of minerals are allowed under Danish law. A tax of $0.91 per cubic meter was levied against all extracted minerals, regardless of type or ownership. However, this tax is exempted if the mineral is exported. The permitting procedure for mineral production is executed by individual counties, and the environmental regulations are at a level comparable to the other European Union (EU) member countries.

The mining and metal industry works closely with the Ministry of Environment and Energy, the Danish Environmental Protection Agency, local and community governments, and citizen groups to minimize any adverse effects to the environment. Environmental protection is the main focus of the Danish Environmental Protection Agency. A common goal of the steelworks and other industrial concerns was to make use of as much raw material taken into the plant as possible and to maximize the use of any byproducts, such as flue dusts.

The Danish Environmental Protection Agency proposed a ban on the import, sale, and production of compounds of lead and products that contain compounds of lead. Almost every major and minor use of lead in Denmark could be hit by this proposed ban with the exception of batteries, which were not included in the ban. A time limit would be applied for the elimination of the applications (Metal Bulletin, 1997).

Continued close cooperation with the other member countries of the EU was very important for Denmark because these countries remain the major export markets. Most of the mineral commodities produced in Denmark were exported with a majority shipped to EU countries.

Denmark's steel industry was small compared with the majority of other EU countries and, as a result of its size, was not affected by the proposed cuts being studied by the European Commission in its efforts to make the EU steel industry more competitive with those of other countries. *(See table 1.)*

Denmark has no known economically exploitable reserves of metallic ores; but it does have large reserves of nonmetallic materials, such as chalk, diatomaceous earth, limestone, and sand and gravel. Denmark's industrial minerals sector was based on easily accessible materials, such as chalk and limestone, and is well developed. Cement, chalk for paper filler, ground limestone, and lime, including agricultural and burnt, were produced. The structure of the Danish mineral industry, listing its major components, is shown in table 2.

Denmark was the only commercial producer of moler, which consists of a natural mixture of diatomite and from 20% to 25% smectite clay. Moler has a variety of applications and is an important ingredient of insulation bricks.

Petroleum production continued to exceed consumption, allowing Denmark to stay self-sufficient in petroleum. An increase in natural gas production allowed the continued exporting of about 20% of Denmark's production. Danish Underground Consortium (DUC) was responsible for virtually the entire production from Denmark's North Sea petroleum and natural gasfields. Denmark is the third largest producer in western Europe after Norway and the United Kingdom. A.P. Moeller Group owned 39% of DUC. Its two partners, Shell Corp. and Texaco Corp., owned 46% and 15% respectively. DUC's production from 12 fields exceeded the total Danish oil and gas consumption.

Faroe Islands

The Faroe Islands, a self-governing overseas administrative division of Denmark, has no known mineral reserves. The economy remained dependent on fisheries, which collapsed in the early 1990's, causing an economic crisis. However, this could change if a dispute with the United Kingdom over a wide strip of sea between the Faroe Islands and the Shetland Islands, which has continued for the past few years, is eventually settled in favor of the Faroes. The dispute concerned the boundary of the economic zone of the Faroe Islands and the Shetland Islands and intensified as a result of oil having been discovered in the Shetland zone less than 20 kilometers (km) from the present boundary and in the disputed zone. Commercially viable findings of oil or natural gas have not been found on the Faroe Islands.

The principal involvement of the Faroe Islands in the international minerals industry has been as a market for imported materials to support the local fishing-based economy. The imports were principally fuels, fertilizer materials, and building products such as cement.

Greenland

Since the cessation of mining activities in 1990, Greenland, a self-governing overseas administrative division of Denmark, has been looking for a means of diversifying its economy, which was based almost entirely on fishing and hunting. Recent legislation created favorable licensing terms and investment rules. This, together with diverse rock types in its geology, has resulted in increased mineral exploration in Greenland.

In 1997, several companies conducted exploration over more than 28,000 square kilometers (km²). Exploration has been directed toward base metals, diamonds, gold, industrial minerals, iron, nickel, and platinum-group metals. The Danish and the Greenland Governments were actively encouraging mineral exploration activities, and the Geological Survey of Denmark and Greenland provided support where possible.

Platinova A/S reported the recovery of a microdiamond from a sample of kimberlite boulders on a lake shore in central west Greenland. The 0.01-carat diamond was recovered from a sample taken from Platinova's 4,332-km² exploration concession. Since the discovery, Platinova has also found a number of kimberlite boulders and dykes and was planning on conducting a detailed airborne geophysical survey of the area (Mining Journal, 1997).

The joint-venture exploration project of Dia Met Minerals Ltd., Canadian Mountain Minerals Ltd., and Quadrant Resources reported that it had discovered 200 kimberlite float occurrences and 4 outcropping kimberlite dykes. One of the dykes tested positive for diamonds. The joint venture reportedly would spend $3.8 million in 1997-98 to complete helicopter-supported geophysics and to continue the exploration program, including followup heavy-mineral sampling (Dia Met Minerals, 1997, Greenland joint venture for diamonds, August 11, 1997, accessed April 20, 1998, at URL http:// www.diamet.com/ 110897.html).

Denmark and Greenland awarded an international consortium a license for offshore petroleum and natural gas exploration and exploitation off Nuuk in West Greenland. The consortium was headed by Statoil of Norway and Philips Petroleum of the United States; each held 38.25% of shares. The consortium also included the Danish-Greenland group Nunoil, which held 15%, and Denmark's Dopas, which owned 8.5%. Preliminary seismic surveys indicated that the offshore area known as Fylla Banke, located in the Baffin Sea some 50 to 150 km west of Nuuk, appeared to contain large quantities of natural gas and some petroleum.

The subsea continental shelf along Greenland's western coast appeared to contain natural gas and petroleum reserves similar to those in the North Sea. However, the waters are more than 1,000 meters deep, and special technology would be required to exploit the deposits. Statoil was carrying out seismic surveys in 1997, and the first exploratory well was expected to be drilled in 1998 at the earliest. The concession covers an area of 9,487 km² and has been awarded for two 4-year periods until December 31, 2004 (Alexander's Gas & Oil Connections, 1996, NK-US Consortium wins oil and gas license off Greenland, December 1996, accessed April 21, 1998, at URL at http://www.gasandoil.com/goc/company/cne65102.htm).

Denmark had a well-developed modern transportation system. There are standard gauge rail lines totaling 2,770 km in length. Highways consisted of 66,482 km, of which 64,551 km was paved. Inland waterways totaled 417 km. Principal ports were Ålborg, Århus, Copenhagen, Esbjerg, and Frederica. There were numerous secondary and minor ports.

Denmark and Greenland have a political and administrative relationship. The Danish Government is actively seeking to develop both area's nonfuel mineral resources, particularly in Greenland. The hopes are that mining can once again become an important sector of the country's economy.

References Cited

Metal Bulletin, 1997, Denmark tries to ban most lead: Metal Bulletin, no. 8229, p. 27.

Mining Journal, 1997, Platinova diamond: Mining Journal, v. 329, no. 8441, p. 116

Major Source of Information

Geological Survey of Denmark and Greenland
Thoravej 8
2400 Copenhagen NV, Denmark

TABLE 1
DENMARK: APPARENT PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1993	1994	1995	1996	1997 e/
Aluminum metal, secondary	14,000	15,000	14,000 e/	14,500 e/	14,000
Cement, hydraulic	2,270,000	2,430,000	2,584,000	2,628,528	2,683,039 3/
Chalk	386,000	414,000	366,000	359,378	427,634 3/
Clays:					
Fire clay	13,400	1,530	2,000 e/	1,800 e/	20 3/
Kaolin e/	3,500	3,500	3,500	3,000	3,000
Other	267	224	6,000 e/	8,050 e/	8,000
Moler e/	95,000	95,000	180,000 r/	182,000	248,000
Extracted moler e/ 2/ thousand cubic meters	190	190	186 3/	185	185
Gas:					
Manufactured e/ terajoules	1,700	1,700	1,500	1,210 3/	1,500
Natural:					
Gross e/ 2/ million cubic meters	6,350 3/	6,900	6,320	7,500	9,530 3/
Marketable do.	4,270	4,630	4,700	5,710 3/	6,960 3/
Iron and steel metal, steel: 2/					
Crude	603,000	722,000	654,000	737,000 r/	787,000 3/
Semimanufactures	527,000	638,000	631,000 r/	621,000 r/	625,000
Lime, hydrated and quicklime	123,531	125,000	117,000	108,628	115,129 3/
Natural gas plant liquids e/ thousand 42-gallon barrels	48,000	48,000	46,000	45,000	45,000
Nitrogen, N content of ammonia e/	1,770 3/	1,700	1,600	1,600	1,600
Peat	188,709	190,000	205,000	204,465	205,000
Petroleum:					
Crude 2/ thousand 42-gallon barrels	63,500	68,800	67,858	78,795 r/	83,950 3/
Refinery products: e/					
Liquefied petroleum gas do.	1,700 3/	1,600	1,600	13,879 3/	1,600
Gasoline do.	12,800 3/	30,000	32,000	31,247 3/	30,200 3/
Naphtha do.	1,210 3/	1,200	1,200	1,666 3/	1,200
Mineral jelly and wax do.	4 3/	4 3/	4	-- r/	--
Jet fuel do.	1,630 3/	1,930 3/	1,800	1,800	1,800
Kerosene do.	109 3/	110	100	93 3/	100
Distillate fuel oil do.	31,400 3/	28,400 3/	28,000	26,590 3/	28,000
Refinery gas do.	1,700	1,700	1,700	2,880	1,600
Lubricants do.	300	260 3/	300	300	300
Residual fuel oil do.	15,600 3/	13,700 3/	13,500	15,951 3/	13,500
Bitumen and bituminous mixtures do.	60	52 3/	50	-- r/	--
Petroleum coke do.	3	3	3	59 3/	60
Total do.	66,516	78,959	80,257	94,465 r/	78,360 r/
Phosphates, crude, gross weight	1,480	1,270	1,200 e/	1,200 e/	1,200
Salt, all forms	591,055	633,524	603,326	600,000 e/	600,000
Sand and gravel: e/					
Onshore thousand cubic meters	20,000	20,000	20,000	18,000	18,000
Offshore do.	5,000	5,000	5,000	5,000	5,000
Total do.	25,000	25,000	25,000	23,000	23,000
Of which, sand, industrial (sales) do.	125	25	50	50	50
Stone:					
Dimension (mostly granite) e/	26,000	24,800	25,000	27,198 3/	26,000
Limestone:					
Agricultural	584,000	703,000	826,000 e/	695,380	700,000
Industrial	220,000	252,000	250,000 e/	250,000 e/	250,000
Sulfur, byproduct	10,357	10,100	8,000 e/	7,465	10,585 3/

e/ Estimated. r/ Revised.

1/ Table includes data available through March 1998 based on estimated sales of domestically produced mineral commodities.

2/ Production.

3/ Reported figure.

TABLE 2
DENMARK: STRUCTURE OF THE MINERAL INDUSTRY IN 1998

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Cement		Aalborg Portland A/S	Plant at Rordal	3,000
Chalk		A/S Faxe Kalkbrud	Quarries at Stevns and Sigerslev	250
Diatomite (moler)	thousand cubic meters	Skamol-Skarrehage A/S	Quarries on Mors and Fur Islands	115
Do.		Dansk Moler Industri A/S	Quarries on Fur Island	80
Kaolin		Aalborg Portland A/S	Mine and plant on Bornholm Island	25
Lime		A/S Faxe Kalkbrud (Aalborg Portland Holding A/S)	Plant at Stubberup, near Fakse, on Zealand Island	200
Natural gas	million cubic meters	Maersk Olie og Gas A/S	Roar and Tyra Gasfields, Danish North Sea	2,550
Petroleum:				
Crude	barrels per day	Dansk Undergrunds Consortium	Dan, Gorm, Rolf, and Tyra, Danish North Sea	127,000
Refined	do.	A/S Dansk Shell	Fredericia	55,000
Do.	do.	Kuwait Petroleun Refining A/S	Gulfhavn	56,500
Do.	do.	Statoil A/S	Kalundborg	65,000
Salt		Dansk Salt I/S	Mine (brine) at Hvornum, plant at Mariager	600
Steel		Danish Steel Works Ltd. (Det Danske Stalvalsevaerk A/S) (30% Government owned)	Plant at Frederilsvaerk	750

THE MINERAL INDUSTRY OF

ESTONIA

By Richard M. Levine

Estonia was one of the most advanced countries in pursuing market economic reform to emerge from the control of the former Soviet Union (FSU). In 1997, Estonia's gross domestic product (GDP) increased by 11.4% compared with that of 1996 (Statistical Office of Estonia, 1998, Gross domestic product by years, accessed September 18, 1998, at URL http://www.stat.ee/wwwstat/content/I_S_KP_AA/1.html). Estonia was 1 of 10 Central and East European states for which negotiations were proceeding for membership in the European Union (EU); it was the only one of the three Baltic States and the only country of the FSU being offered EU membership (Dusseldorf Handelsblatt, 1997).

Estonia's mineral industry consisted primarily of mining oil shale, peat, and industrial minerals, including clays, limestone, and sand and gravel; phosphate mining in Estonia had ceased because of environmental concerns. Minerals are used to produce a variety of products, including cement and other construction materials and fertilizers and other chemicals. In 1997, mining and quarrying accounted for only 1.7% of the country's GDP. Estonia's construction materials industry, which was based on domestic mining of clay, limestone, and sand and gravel, accounted for about 5% of industrial output; more than 45% of the output from this sector was exported. Predictions were that the construction materials industry would grow by 15% in 1998 in accordance with the development of the Estonian economy. The chemical industry, which was based primarily on the use of oil shale as a raw material, accounted for 4.2% of industrial output in 1997; Chemical industry output decreased by 5% compared with that of 1996, and development of the chemical industry depends on whether oil shale production can be maintained. In 1997, oil shale production decreased to 12.9 million metric tons (Mt) compared with 13.3 Mt in 1996 (Confederation of Estonian Employers and Industry, 1998).

Although Estonia was not a major mineral producer, it was a major transshipper of mineral products produced in Russia. Transport and storage services for minerals were a significant source of revenue. In 1997, according to Estonia's foreign trade statistics, "mineral products" and "nonprecious metals and metal products" accounted for 11.9% of the total value of exports compared with 12.5% in 1996; in 1997, they accounted for 16.3% of the total value of imports compared with 17.3% in 1996 (Bank of Estonia, 1998).

Estonia is attempting to provide better information about and assess better its mineral resources. The Geological Survey of Estonia, founded during the Soviet era, has its own library and repository of reports on geologic investigations in the country and on the status of mineral reserves. The Geological Survey has nine departments, including a laboratory, workshops, and other units, and has offices in Tallinn, Keila, and Tartu. In addition, seven field camps are situated throughout the country. During the Soviet period, most of the maps, data bases, and reports, as well as the status of mineral reserves were classified as state secrets. Now Estonia has begun to publish geologic information, some of which had been restricted by Soviet secrecy laws, in the following series:

- Annual of the Geological Survey of Estonia
- State of the Groundwater (Bulletin of the Hydrogeological Department
- Set of Geological Maps at the Scale of 1:2, 500,000 (with explanatory notes)
- Set of the Geological Maps at the Scale of 1:400,000 (with explanatory notes)

The Geological Survey of Estonia is also involved in joint investigations with the geological surveys of Denmark, Finland, Germany, Latvia, Lithuania, and Sweden (Geological Survey of Estonia, [Untitled], accessed January 6, 1998, at URL http://www.gsf.fi/estonia/esthome.html).

Estonia is engaged in an effort to clean up its environment and plans to spend 10 billion kroons to implement a cleanup program that will extend to 2010. One serious source of pollution was the burning of oil shale in Estonia's oil-shale-based electric power plant. One of the worst problems involves the Sillamae uranium processing plant where waste was emptied into a large tailings pond 20 kilometers from the Baltic Sea.

The Sillamae uranium-ore-processing plant had been processing uranium ore mined in Estonia, but uranium was mined in Estonia for only an 8-year period. Following the cessation of uranium mining in Estonia, the Sillamae plant processed imported uranium ores from Eastern European countries. The plant was apparently transformed at some point into the RAS Silmet rare-earth metals plant and began to process a range of imported ores. Heavily contaminated water was seeping through the bottom layers of the tailings pond at Sillamae into the Baltic Sea, and the gravel dam that separated the pond from the Sea was slowly shifting towards the Sea. Also, storms that generate waves were damaging the dam and furthering its shift towards the Baltic Sea. The Estonian Government was aware of these problems and seeking affordable solutions (European Union, 1997; Ida-Virumaa, March 11, 1996, Economy—Present state and potential, accessed April 28, 1998, at URL http://www.ciesin.ee/undp/iviru/eco.html).

Environmental protection measures were raising the cost of production at the Silmet plant. Silmet warned that high environmental taxes could force it to cut production and to lay off one-third of its workers by the end of the year. Nevertheless, Silmet was considering introducing new production technologies to produce high-quality rare-earth metal compounds and concentrates. Silmet reported losses of 4 million kroons on a turnover of 95.5 million kroons in the first half of the year. The company hoped to break even by the end of the year. In 1996, the plant declared a loss of 57 million kroons (Baltic Business Weekly, October 27-November 2, 1997, Estonia—Enviro taxes to force Estonia to sack 1/3rd workers, accessed February 9, 1998, at URL http://www.alkhemy.com/latv/LAT.html).

Oil shale, Estonia's most important natural resource, has been used in industry for more than 80 years. Oil shale was produced from six underground mines and three open pits. From 80% to 85% of the oil shale produced was used for the generation of electricity with the remainder being used as a raw material for chemical production at the Kohtla-Jarve plant. Estonia produced about 30% of its domestic energy requirements owing mainly to its oil shale production but also, to a small degree, to its peat production. Emphasis was being placed on increasing peat consumption to lessen dependency on fuel imports, and the country was also seeking opportunities to export peat briquettes. In 1997, peat production increased to 1.1 Mt compared with 952,200 metric tons in 1996 (Confederation of Estonian Employers and Industry, 1998).

According to the Estonian Environmental Ministry, environmental concerns could result in the end of oil shale production within 10 to 15 years. Furthermore, Estonia's use of oil shale for the generation of electricity loomed as a major issue confronting the country's admission to the EU as the complaint can be raised that Estonia enjoys an unfair advantage from cheap but polluting electricity generation (Financial Times, 1998).

In November, the Estonian Privatization Agency endorsed a plan to privatize a number of enterprises, including Eesti Polevkivi, the Estonian oil shale mining enterprise (Summary of World Broadcasts, 1997). Also in 1997, plans called for the state-owned Estonian oil shale mining complex to lay off 900 employees, equal to one-tenth of its workforce. The workers were no longer needed owing to the introduction of new labor-saving equipment. The layoff was to involve miners and office staff and would be in addition to the 1,500 workers who had been dismissed since 1991. The company was, however, able to find new customers for its oil shale besides Estonia's power and chemical plant, with its shale also being purchased by metal manufacturers in Latvia, Lithuania, and Ukraine (Summary of World Broadcasts, 1997).

The Estonian Privatization Agency announced that Erioli Ltd. had won the tender for privatization of the chemical plant in Kohtla-Jarve that utilizes oil shale as raw material. Besides the purchase price, the Agency's decision was influenced by Erioli's business plan, which provided for future investments and planned for relations with local authorities. Erioli owned a number of fuel oil outlets under the trade name "Oil Stop," and had 10 outlets in Estonia (Baltic Business Weekly, October 27-November 2, 1997, Estonia—Kriviter chemical plant to be sold to Eriolil, accessed February 9, 1998, at URL http://www.alkhemy.com.latv/LAT.html).

Nevertheless, owing to the fall in reserves of shale (Estonia's main source of fuel), its low calorific value, and environmental concerns, the share of shale in the energy balance was to be cut from 64% in 1997 to between 47% and 50% by 2010, with a simultaneous increase in the share of gas from 12% to 24% (Interfax Oil, Gas, and Coal Report, February 6-12, 1998, [Untitled], accessed March 18, 1998, at URL http://fbis.fedworld.gov); Tallinn TV-3 Television Network, February 18, 1998, 1720 gmt, Estonian parliament approves government energy program, accessed February 25, 1998, at URL http://fbis.fedworld.gov.

Estonia currently gets all its gas from Russia and is hoping that the construction of a northern gas route will present the possibility of linking up with the European gas network. The country has a chance to be involved in this system because its territory could be used for an access route to Latvia's natural gas reservoirs, which currently contain 2.5 billion cubic meters, but could hold up to 10 billion cubic meters. Estonia considers that it might be chosen for a gas pipeline route running to the storage facilities in Latvia. Estonia's gas company has completed construction of a pipeline from Rake, near Tallinn, to the Latvian reservoirs. For Estonia to link up to the northern route, a pipeline linking Tallinn to Helsinki would need to be laid on the bottom of the Baltic Sea. With connection to the northern route, Estonia not only would get an alternative source of gas, but also would become a gas transit country (Interfax Oil, Gas, and Coal Report, February 6-12, 1998, [Untitled], accessed March 18, 1998, at URL http://fbis.fedworld.gov); Tallinn TV-3 Television Network, February 18, 1998, 1720 gmt, Estonian parliament approves government energy program, accessed February 25, 1998, at URL http://fbis.fedworld.gov.

Estonia's ports are major gateways for shipments in and out of the countries of the FSU. In 1997, Estonia was experiencing an 18% to 25% growth in the volume of goods transited compared with 1996. This growth was mainly due to the rail transport of petroleum to the port of Muuga from Russia and its subsequent loading on to tankers (Estonian Economy, Estonia as a transit country, October 1977, accessed April 17, 1998, at URL http://www.vm.ee/eng/economy/oktoober/frontsto.html).

One of the biggest investments in the country was in construction of the new Pakterminal oil terminal at Muuga. Intended as a state-of-the-art oil terminal, Pakterminal is a 50-50 joint venture between a group of Estonian entrepreneurs and Paktank of the Netherlands. Russia is now shipping 8 million metric tons per year (Mt/yr) of oil through Muuga. Muuga, which is open all year round and located on the outskirts of Tallinn, has the deepest water of any Estonian port (Financial Times, 1998b).

Estonia was also planning to expand its role as a metals exporter. Officials from Estonia's port of Tallinna Sadam and RUMA-USA, a U.S. company that specializes in metal shipments, signed an agreement worth 1.5 billion kroons to construct a terminal to handle metals at Muuga. Tallinna Sadam's chief executive stated that construction of the terminal, which would be the biggest in the Baltic States, would start in summer 1998, and should be completed in 3 years. The terminal would be built in the port's free customs zone. RUMA-USA also signed an agreement with the Estonian Government for the right to construct the terminal. The president of the U.S. company said that his firm specialized in transporting metal from Russia and planned to raise shipments of metal through Muuga to 3 Mt/yr to 4 Mt/yr. He said that initially the terminal was to have been built at a port in St. Petersburg, but Estonia offered better terms for investment in construction. He said that RUMA-USA was considering construction of a second terminal, also in one of the Baltic States (Interfax Mining and Metals Report, 1998b).

In another deal designed to increase metals exports, ACI Industries Ltd. of the United States was holding talks with the mayor's office in the Estonian city of Paldiski on establishing a company in the city to export Russian scrap metal. ACI, which would handle the transportation of metal to the West, would rent a 33,000-square-meter land plot from the city where it would sort, process, and pack metal for transportation. No decision had yet been made on which of the city's two ports would be used for reexports. A decision was scheduled for spring 1998, and the project then would go into operation in the summer. The project reportedly would not contradict Estonian legislation because the state-run Estonian Metal Export-Import company (EMEX) has a trade monopoly only on metals of Estonian origin and the new operation would transport metals from other countries. The Head of the Domestic Market Department at the Estonian Ministry of Economics stated that there should be no problems in the transit of Russian metal. Also, the Ministry of Economics drafted a resolution for Government consideration on abolishing EMEX's monopoly (Interfax Mining and Metals Report, 1998a).

Estonia, similar to the other Baltic States, envisages its major role as a transit country for minerals. According to the journal of the Estonian Foreign Ministry, one of the most important sectors in Estonia's economy involves the commercial transit of goods (Estonian Economy, Estonia as a transit country, October 1977, accessed April 17, 1998, at URL http://www.vm.ee/eng/economy/oktoober/frontsto.html). Estonia's geographic location places it between the rich natural resources of Russia and the markets of Western Europe and other regions. Estonia is also a bridge for goods produced in Western Europe moving into the Russian market. The importance of this transit trade to Estonia is evidenced by the fact that the transportation of Russian petroleum products has grown sevenfold since 1992. The Estonian Foreign Ministry stated that Estonia provides the shortest route to the European market for the delivery of gas and petroleum from northern Russia. Growth in transit could further expand owing to the opening of a toll-free zone in Muuga (Estonian Economy, October 1977, Estonia as a transit country, accessed April 17, 1998, at URL http://www.vm.ee/eng/economy/oktoober/frontsto.html).

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TABLE 1
ESTONIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity e/
Cement	Punane-Kunda plant	Punane-Kunda region	1,500
Limestone, for cement	Punane-Kunda deposits	do.	NA
Oil shale	Eesti Polevkivi includes seven mines, four open pits, and five beneficiation plants	Ida-Virumaa country	25,000
Peat	388 deposits under exploitation	Production in all regions of country, but major facilities in northern and southeastern part of country	6,000
Phosphate rock	Maardu (operation ceased)	Maardu	
Rare earths	RAS Silmet plant	Sillamae region	NA
Sand, for glass	Piuza deposit	Southeastern part of country	50
Sand and gravel cubic meters	Production at more than 700 deposits, largest enterprises: Silikat association exploiting Tallinn deposit	Tallinn region	2,000,000
Do.	Akhtmeskiy industrial materials complex exploiting Panyarve deposit	Pannyarve region	1,500,000
Do.	Vyrukivi plant exploiting Abissaare, Koryusmyae, Pyussa-palu deposits	Southeastern part of country	1,500,000
Do.	Tartu construction materials plant exploiting Vooremyagi and Kukemetsa deposits	Tartu region	800,000

e/ Estimated. NA Not available.

THE MINERAL INDUSTRY OF

FINLAND

By Harold R. Newman

On January 1, 1995, Finland acceded to the European Union (EU). At that time, amendments to the Finnish Mining Law concerning reciprocity took effect and allowed any individual, corporation, or foundation having its principal place of business or central administration within the EU to enjoy the same rights to explore for and exploit mineral deposits as any Finnish citizen or corporation. This has encouraged foreign investment and increased exploration activities of major and junior companies. Exploration emphasis was on base-metal, diamond, and gold deposits.

Mineral legislation and regulations are covered under the Mining Act (Kaivoslaki 503/65), the Mining Decree (Kaivosasetus 663/65), and Amendments to the Mining Law (1427/92, 1625/92, 474/94, 1571/94, 208/95, 561/95, and 1076/95). These are referred to collectively as the "Mining Law". The minerals covered by the Mining Law include about 50 metals and 30 minerals, as well as gems, marble, and soapstone (Kortman and others, 1996).

Government involvement in the mineral industry was considerably higher than in any of the other EU countries. Government-owned companies, such as Finnminers Group (hard-rock drilling/materials handling and ore processing), Kemira Oy (chemicals), Outokumpu Oyj (base metals mining and mining technology), and Rautauukki Oy (steel production), dominated the domestic mineral industry, and Government organizations, such as the State Geologic Research Institute and the State Technological Research Center were active in exploration and research. Because of Outokumpu and Finnminers, Finland was a world leader in the technology of underground mining, ore processing, and metallurgy.

The country has well-established mining, mineral-processing, and refining industries; the diminishing supply of indigenous metalliferous raw materials, however, required that most of the feed for smelters (100% of iron ore concentrate, 80% of zinc concentrate, and 60% of nickel matte and concentrate) be imported from various sources. Production of ores and minerals showed a small overall increase compared with that of 1996. *(See table 1.)*

The major mineral resources companies are listed in table 2. Outokumpu's Kemi Mine, the only chromite mine in Finland, was a significant chromite producer. Current output was around 1 million metric tons per year of chromite ore from two open pits. The ore was processed by a multistage concentration method, that is based on the specific gravity between the minerals, as well as on their magnetic properties. The output of about 600,000 metric tons per year (t/yr) of concentrates (upgraded lumpy ore and metallurgical-grade concentrate) was used as raw materials at Outokumpu's Ferrochrome Works at Tornio (Outokumpu Oyj, 1997, Outokumpu Chrome Oy, accessed July 9, 1998, at URL http://www.outukumpu.fi/basemetals/copper.htm).

Although it has no primary copper mines, Finland does produce copper as an associated mineral from Outokumpu's primary zinc mine at Pyhäsalmi. Outokumpu's blister copper capacity was 160,000 t/yr, cathode copper capacity was 125,000 t/yr, and nickel capacity was 32,000 t/yr. Overall, Outokumpu produces 2% of the world copper (Outokumpu Oyj, 1997, Products—Copper, accessed June 29, 1998, at URL http://www.outokumpu.fi/basemetals/copper.htm).

Finland has never been a major gold producer, although exploration for gold in 1997 was being conducted by several domestic and foreign companies, as well as the Geological Survey of Finland (GSF). Activity was mainly centered on the Lapland Greenstone Belt and the Archean Greenstone Belt of eastern Finland and the Svecofennian Schist Belt in the south.

Terra Mining Oy started open pit gold operations at the Pahtavaara Mine in June 1996 and achieved full production in 1997. Gold mineralization occurs within a distinct talc/chlorite alteration zone, which is up to 100 meters (m) wide and appears to be a typical splay structure related to a major east-west shear zone. Within this alteration zone, gold is present in quartz-barite vein zones up to 10 m wide. Geologically, the style of mineralization is very similar to shear-zone-hosted gold deposits related to major breaks in the Canadian Shield of North America. Terra completed 2400 m of drilling in nine holes designed to further test the down plunge extension of the steeply dipping ore zones being mined. All nine holes intersected the mineralization at depths between 100 and 250 m below surface (Williams Resources Inc., 1997, Untitled, accessed February 20, 1998, at URL http://www.info-mine.com/william.htm).

The only remaining domestic nickel mine in operation in 1997 was Outokumpu's Hitura Mine, which has produced more than 8 million metric tons of ore since 1965.

All steel production in Finland was from imported concentrates and iron pellets. Two-thirds of the raw material came in the form of fines from Sweden's Luossavaara-Kiirunavaara AB. The balance came from Russia in the form of iron pellets from Kostamus and fines from Olenogorsk.

The Finnish government sold 26.5% of its 68.7% stake in the country's largest steelmaker, Rautaruukki Oy. SBC Warburg and Union Bank of Switzerland exercised their option to purchase 3.8 million shares in the company. This brings the total number of shares sold to institutional investors to 31.9 million and 7.4 million, respectively; the selling price was $8.30 per share. The capital raised will be used to complete the company's current investment program, including the upgrading of flat products operations. The Government was expected to keep its remaining holding of 42.3% in Rautaruukki for the foreseeable future (Metal Bulletin, 1997).

The only mine producing zinc in 1997 was Outokumpu's Pyhäsalami Mine at Pyhajarvi. The zinc concentrate was shipped to the Kokkola smelter, and the associated copper concentrate was shipped to the Harjavalta smelter. Pyhäsalami, together with Outokumpu's Tara Mine in Ireland, supplied about 80% of the feed for the Kokkola smelter.

Outokumpu announced that it would make a total investment of about $90 million in the zinc plant in Kokkola, whereby the production capacity would be increased by about one-third from 170,000 to 225,000 t/yr of zinc. Implementation was expected to take about 2 years. Use of a new direct method of leaching zinc concentrates, developed by Outokumpu, was expected to improved productivity significantly (Outokumpu Oyj, 1997, Untitled, accessed October 29, 1997 at URL http://www.outokumpu.fi/NEWINFO/press/kokkola.htm).

Outokumpu signed an agreement for nickel matte with Mineraçao Serra Fortaleza, Minas Gerais, Brazil, a wholly owned subsidiary of the Rio Tinto Group. Outokumpu will buy the planned 10,000 t/yr of nickel matt from the new Fortaleza smelter for a period of 10 years and supplied a license to use its direct nickel smelting process and provided expertise for the Fortaleza smelter. The metal will be shipped to the Harjavalta refinery in Finland. Harjavalta has a potential capacity of 40,000 t/yr, and the agreement with Fortaleza would help ensure the continuity of long-term supplies (Mining Journal, 1997b).

Malmikaivos Oy discovered a series of kimberlite bodies in northern Finland. Malmikaivos, a fully owned subsidiary of Ashton Mining of Australia, discovered 30 kimberlite pipes, one-half of which were diamondiferous. Two pipes, which were closely studied, contained quantities of clear and colorless diamonds. A surface sample of 23 metric tons was taken from a pipe with a 2 hectare (ha) area, which yielded 26 carats per 100 t, mostly of good quality. Another pipe, slightly more than 1 ha, contained 13 to 26 carats per 100 t based on a 9.4-t sample (Geological Survey of Finland, 1997, Diamond exploration, accessed May 29,1997 at URL http://www.gsf.fi/explor/minfinl.htm).

To was expanding its exploration for kimberlite pipes Ashton Mining entered into an agreement with Dia Met Minerals Ltd. of Canada. A country-wide regional sampling program has identified several prospective areas. The joint venture covered two areas in the eastern part of the country; one of 38,475 square kilometers (km^2) and another of 40,750 km^2 (Northern Miner, 1998). Several other companies, including Rio Tinto Mining & Exploration Ltd., Finnsearch Oy, Conroy Plc. of Ireland, and Baltic Minerals Finland Oy, were active in diamond exploration; none of the companies had issued any preliminary findings at yearend.

Finnminerals Oy was the largest producer of paper-grade talc in Europe and Finland's sole producer of talc. Previously part of the largest European paper conglomerate, UPM-Kymmene, Finnminerals was sold to Western Mining Corp. Holdings Ltd. of Australia (50%) and Plüss-Staufer AG of Switzerland (50%). The company also had talc slurry plants in the Netherlands and Sweden.

Talc de Luzenac, a French subsidiary of Rio Tinto of the United Kingdom, won the bid to investigate a talc deposit at Sotkamo in northern Finland. It has 2 years to in which to evaluate the size, quality, and economics of the deposit prior to making a development decision. The worlds largest producer of talc, Talc had 15 operations in Europe and North America (Mining Journal, 1997a).

GSF placed emphasis on exploration for pigment minerals, such as ilmenite, high-quality carbonates, and kaolin. Also, a number of dimension stone deposits were being assessed by various companies.

Finland was one of the largest energy consumers in western Europe. Only about one-third of its energy requirements were satisfied by indigenous sources, namely, hydro and nuclear power, peat, and wood. All other energy sources, such as coal, natural gas, and petroleum, were imported.

Finland was seeking to bring its two principal public energy companies—the oil and chemical group Neste and the electricity company Imatran Voima (IVO), into a closer partnership, with a possible merger of the groups. IVO began to prepare for the liberalization of the European energy market by taking over the Swedish company Gullspang Kraft in 1996 (Energy News, 1997, Finland could merge oil and Electricity, accessed June 19, 1997, at URL http://www.info.ft.com/media/June 1997.htm).

The operating environment in Finland is generally favorable for exploration and mine development. GSF identified a number of mineral deposits for which information was available. The country has a long mining history and a traditional focus on primary resources, such as mining, forestry, and farming. Finnish mining equipment manufacturers were recognized throughout the world's mining community.

Finland can be considered to be an attractive exploration target in several respects. Geoscientific data coverage is excellent, infrastructure is highly developed with good port facilities, an extensive high-voltage power grid, and a comprehensive road network. Taxation laws are favorable, and the mining law is strong. Large areas can be considered to be under explored for many commodities, and the likelihood of additional discoveries may be enhanced with the entrance of foreign companies into the Finnish mineral industry. Lastly, the country is located in close proximity to major markets.

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Major Source of Information

Geological Survey of Finland
Betonimiehenkuja 4
02150 Espoo
Finland

TABLE 1
FINLAND: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
METALS						
Aluminum metal, secondary		29,900	35,466	35,090	35,308 r/	33,000
Cadmium metal, refined		785	548	539	648	540
Chromite:						
Gross weight:						
Lump ore e/	thousand tons	191	225	214	210	215
Concentrate e/	do.	300	341	373	360	365
Foundry sand e/	do.	20	7	11	12	9
Total	do.	511	573	598	582	589
Cr2O3 content:						
Lump ore e/	do.	45	76	80	70	75
Concentrate	do.	170	150	150	150	150
Foundry sand e/	do.	3	3	3	3	3
Total	do.	218	229	233	223	228
Cobalt, metal, powder, and salts		2,150	1,443	1,709	2,110 r/	2,000
Copper:						
Concentrate, gross weight		44,154	34,410	26,000	24,000	22,000
Mine output, Cu content		11,131	13,243	9,790	9,261 r/	8,500
Metal:						
Smelter		107,201	129,265	120,577	178,675 r/	159,000
Refined		73,373	69,177	73,700	110,715 r/	116,000
Gold metal	kilograms	1,385	1,372	2,061	3,070 r/	3,100
Iron and steel, metal:						
Pig iron	thousand tons	2,535	2,597	2,242	2,457	2,780 2/
Ferroalloys, ferrochromium	do.	218	254	247	228 r/	230
Steel, crude	do.	3,255	3,419	3,176	3,301	3,687 2/
Semimanufactures, rolled	do.	2,300 e/	3,121	3,242	3,272	3,295 2/
Mercury		98	83	90	88	90
Nickel:						
Concentrate, gross weight		127,400	107,865	110,000 e/	100,000 r/ e/	10,000
Mine output, Ni content		8,290	7,652	3,439	2,136 r/	3,000
Metal, electrolytic		14,777	16,902	21,268	29,141 r/	30,000
Platinum-group metals:						
Palladium	kilograms	100 e/	96	95	182 r/	180
Platinum	do.	--	37	37	62 r/	60
Selenium metal	do.	30,400	30,000	29,690	42,000 r/	40,000
Silver metal	do.	15,896	26,100 r/	26,098	32,506 r/	32,500
Zinc:						
Concentrate, gross weight		42,400	41,971	43,000	58,000	60,000
Mine output, Zn content		22,529	16,916	16,385	26,294 r/	30,800
Metal		170,934	173,200	176,600	176,300	175,300
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand tons	835	864	907	975 r/	960
Feldspar		51,477	43,483	41,808	40,265 r/	40,000
Lime	thousand tons	250 e/	321	401	394 r/	400
Mica		4,488	5,591	--	--	--
Nitrogen, N content of ammonia		10,000 e/	11,894	5,933	5,107 r/	6,000
Phosphate rock, apatite concentrate:						
Gross weight	thousand tons	628	657	671	657 r/	650
P2O5 content	do.	227	236	243	240 r/	235
Pyrite, gross weight	do.	691	839	829	813 r/	950
Sodium sulfate	do.	30 e/	36	34	29 r/	30
Stone, crushed:						
Limestone and dolomite:						
For cement manufacture	thousand tons	1,005	1,047	1,114	1,128 r/	1,200
For agriculture	do.	1,035	898	787	892 r/	900
For lime manufacture	do.	348	343	335	303 r/	300
Fine powders	do.	568	382	316	289 r/	300
Metallurgical e/	do.	2	2	2	2	2
Total	do.	2,958	2,672	2,554	2,614 r/	2,702
Quartz silica sand	do.	167	71	30	31 r/	30
Soapstone	do.	27	29	31	--	--

See footnotes at end of table.

TABLE 1-Continued
FINLAND: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
INDUSTRIAL MINERALS--Continued						
Sulfur:						
S content of pyrite	thousand tons	292	369	422	425	430
Byproduct:	do.					
Of metallurgy	do.	225 e/	216 r/	215	291 r/	290
Of petroleum	do.	32 e/	41	37	38	40
Total	do.	549	626 r/	674	754 r/	760
Sulfuric acid	do.	1,300 e/	1,084	1,159	1,287 r/	1,200
Talc	do.	399	453 r/	464	345 r/	350
Wollastonite		26,796	27,757	29,592	22,304	20,000
MINERAL FUELS AND RELATED MATERIALS						
Peat:						
For fuel use	thousand tons	3,945	6,960 r/	6,300 r/	7,200 r/	8,000
For agriculture and other uses	do.	500 r/	1,040 r/	750 r/	1,850 r/	2,000
Petroleum refinery products	thousand 42-gallon barrels	76,000 e/	80,486	79,000 r/	83,000 r/	82,000

e/ Estimated. r/ Revised.

1/Table includes data available through May 1998.

2/ Reported figure.

TABLE 2
FINLAND: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Ammonia		Kemira Oy (Government, 98%)	Plant at Oulu	75
Cadmium, metal		Outokumpu Oyj (Government, 40%; Insurance Co., 12.3%)	Smelter at Kokkola	1
Cement		Partek Cement Oy (Partek Corp., 50%; Metra Corp., 50%)	Plants at Lappeenranta and Pargas	1,200
Chromite		Outokumpu Oyj (Government, 40%; Insurance Co., 12.3%)	Mine at Kemi	730
Copper:				
Ore, Cu content		Outokumpu Oyj (Government, 40%; Insurance Co., 12.3%)	Mines at Pyhäsalmi, Saattopora, and Hitura	10
Metal		do.	Smelters at Harjavalta and Pori	160
Feldspar		Lohja Oy (Metra Corp. , 100%)	Mines and plants at Haapaluoma, Kemio, and Peraseinajok	50
Ferrochrome		Outokumpu Oyj (Government, 40%; Insurance Co., 12.3%)	Smelter at Tornio	230
Gold:				
Ore, Au content	tons	do.	Mine at Orivesi	4
Metal	do.	do.	Smelter at Pori	4
Ore, Au content	do.	Terra Mining Oy (Williams Resources Inc., 100%)	Pahtavaara Mine near Sodankyla	3
Limestone		Partek Minerals Oy (Partek Corp., 100%)	Mines at Kolari, Lappeenranta, and Pargas	1,900
Do.		Lohja Oy (Euroc, 100%)	Mines at Mustio and Sipoo	1,650
Do.	/	Rauma-Repola Oy	Mine at Turnio	300
Mercury	tons	Outokumpu Oyj (Government, 40%; Insurance Co., 12.3%)	Smelter at Kokkola	150
Mica		Kemira Oy (Government 98%)	Mine at Siilinjarvi	10
Nickel:				
Ore, Ni content		Outokumpu Oyj (Government, 40%; Insurance Co., 12.3%)	Mine at Hitura	3
Metal		do.	Smelter at Harjavalta	32
Phosphate-apatite		Kemira Oy (Government, 98%)	Mine at Siilinjarvi	700
		Outokumpu Oyj (Government, 40%; Insurance Co., 12.3%)	Mine at Pyhäsalmi	800
Quartz and quartzite		Lohja Oy (Euroc, 100%)	Mines at Kemio and Nilsia	250
Selenium	tons	Outokumpu Oyj (Government, 40%; Insurance Co., 12.3%)	Smelter at Pori	35
Silver	do.	do.	do.	30
Steel		Rautaruukki Oy (Government, 42.3%)	Plant at Raahe	2,100
Do.		Fundia AB (Norsk Jenverk AS of Norway, 50%; Rautaruukki, 50%)	Plants at Aminnefors, Dalsbruk, and Koverhar	850
Do.		Ovako Oy (SKF, 50%; Wartsila, 25%; Fiskas, 20%)	Plant at Imatra	600
Talc		Finnminerals Oy (Western Mining Corp. Holdings Ltd., 50%; Plüss-Staufer AG, 50%)	Mines at Lahnaslampi, Lipsavaara, Luikanlahti, and Poljivari	500
Wollastonite		Partek Minerals Oy (Partek Corp., 100%)	Mine at Lappeenranta	30
Zinc:				
Ore, Zn content		Outokumpu Oyj (Government, 40%; Insurance Co., 12.3%)	Mines at Pyhäsalmi and Mullikkoräme	25
Metal		do.	Smelter at Kokkola	175

THE MINERAL INDUSTRY OF

FRANCE

By Harold R. Newman

France was a major European mineral producer. The traditional mineral industries have been in a state of transition during the past few years. In the past, the heavy economic and political involvement of the state was one of the main elements of the national mineral policy. The reduction of Government subsidies supporting uneconomic mineral operations and the depletion of mineral reserves have had a significant impact on a number of extractive operations in the mineral industry. Efforts have been made to promote the private sector and to reduce the dependence of state-owned companies on subsidies.

In an effort to encourage exploration within the country, the French mining code was modified in July 1995 by a law that established clearer expedited rules to allocate surveying and mining licenses. The Government proceeded with a privatization program involving large state-controlled companies to reduce the direct role of the Government in the economy. Included among nine major companies privatized since 1994 were Péchiney Group, Rhône-Poulenc S.A., Société Nationale Elf Aquitaine (SNEA), and Usinor-Sacilor.

Mineral and metal industries generally maintained their production and other activities at about the same or slightly decreased rate as that of 1996. Several industries, such as bauxite, coal, iron ore, and uranium, have steadily undergone changes during the past few years. Bauxite was no longer mined in France. There was some reprocessing of bauxite waste dumps, the product then being used by cement companies.

The coal and iron ore industries, as well as other mineral producers, were affected by cheaper foreign sources, high operating costs, and the depletion of domestic resources. Coal mining was directed by Charbonnages de France (CdF), a state-owned company. As a result of the high cost of underground production in comparison with cheaper imported coal, CdF was maintaining its policy of investing in high-productivity mines and closing uneconomic operations.

The uranium industry reduced its operations by closing a number of mines and processing plants owing to low market prices and depletion of certain deposits. Some factors in the drop of uranium demand were the reduced cost for petroleum and the increased accessibility of natural gas from the North Sea and the former Soviet Union. Lower petroleum prices meant that fewer new nuclear plants were considered for construction, some older plants were being closed, and the export market for uranium decreased. (*See table 1.*)

The Government maintained efforts to refocus the country's trading patterns toward those countries of the Organization for Economic Co-Operation and Development. Although strong commercial relations continued between France and the United States, Germany remained France's largest export destination. In 1997, France was the 10th largest trading partner of the United States worldwide and the 3d largest trading partner in Europe after the United Kingdom and Germany (Bureau of Economic and Business Affairs, 1997).

Table 2 shows the relation of selected classes of mineral commodities on France's balance of payments position in relation to the European Union (EU) and the world.

Tables 3 and 4 show exports, including reexports, and imports of selected mineral commodities by France.

Government and private companies produced minerals and mineral products, conducted research, and explored domestically and internationally for new mineral resources. *(See table 5.)*

La Source Companie Minière, the main mining affiliate of Bureau de Recherches Geologiques et Minières and a subsidiary of the Normandy Group of Australia, was proceeding with exploration and development of the Chessy copper deposit near Lyon.

Gold mining in France was mostly concentrated in Société des Mines du Bourneix's open-pit and underground operations in the Saint-Yrieix la Perche District south of Limoges and Mines d'Or de Salsigne's underground Salsigne Mine near Carcassonne. Each company produces about 2 metric tons per year (t/yr) of gold. Owing to the drop in gold prices, Salsigne was having increased difficulty in remaining competitive (BRGM Group, 1997, Mineral resources and development, accessed December 8, 1997, at URL http://www.brgm.fr/US/brgm.html).

The famous iron ore basin of northern France stretched from Lorraine, France, northward into Belgium. For many years, the high phosphorus and low iron content of the ore limited its desirability and production has been declining for several years. The Terres Rouges Mine of Acieries Reunies de Burbach-Eich-Dudelang (ARBED) was the only working mine left but was expected to close at yearend 1997.

Usinor Sacilor ranked fourth in the world as a producer of steel in terms of crude steel production and second in terms of sales from steelmaking activities, after Nippon Steel of Japan. Usinor had completed its privatization procedures by yearend 1995. The Usinor-Sacilor Group was organized into three branches—Ugine (stainless steel), which comprised Imphy and Ugine of France and Jones & Laughlin Co. of the United States branch; Sollac (steel flats); Aster (special steels). The Aster branch comprised the following companies: Unimétal, Ascotmétal, Allevard, and IMS. Arus, the iron and steel products marketing subsidiary, was taken over by the Klockner Group (Usinor-Sacilor Group, 1997, Usinor at a glance, accessed November 19, 1997, at URL http://www.usinor-sacilor.fr/english/group/group/).

Mining of lead and zinc has completely ceased in France. Two companies operated primary zinc plants in France in 1997 by using imported ores and concentrates. Société des Mines et Fonderies de Zinc de la Vieille Montagne (VM) of Belgium operated a zinc refinery at Auby-les-Douai with an annual capacity of 210,000 t/yr of zinc. VM's electrolytic plant was one of the most modern in Europe and was built at a cost of $70 million in 1987. Métaleurop Nord S.A.S., operated a 110,000-t/yr primary smelter and a 40,000-t/yr secondary smelter at Noyelles-Godualt.

Compagnie Générale des Matières Nucléaires (COGEMA), the state-owned uranium mining company, was the major producer of uranium in France. A leading mine operator in the world uranium market, COGEMA accounted for about 20% of the world production. However, in recent years, the pace of exploration has decreased and projected future ore requirements have leveled off. Most projects worldwide have been halted or canceled and several mines in France were closed. The Lodeve Mine, near Limoges, was closed in 1997 (COGEMA, 1997, accessed December 8, 1997, at URL http://www.cogema.fr/actualites_gb/communiques/text.htm).

France has 59 nuclear reactors, including 1 fast breeder reactor, representing an installed capacity of 60,000 megawatts of electricity. In 1996, electricity output of nuclear origin was 374.8 billion kilowatt hours. Nuclear power reactors provided almost 77% of electricity generated in France (Electricité de France, 1997, Nuclear power, accessed December 15, 1997, at URL http://www.edf.fr/html/en/edf[?]src/nuc.html).

Denain-Anzin Minéraux Refractaire Ceramique (DAMREC), a subsidiary of the Imetal Group, was the only producer of andalusite in Europe. DAMREC's mining operation was at Glomel, Brittany, and produced about 75,000 t/yr. This placed France second only to South Africa in world output. The company produced three grades of andalusite that were distinguished by different alumina and iron oxide contents. These products were sold to the refractory and ceramic industries (Tournis, 1997).

The primary barite mining area was at Chaillac near Limoges. Barytine de Chaillac, a subsidiary of Solvay Barium Strontium GmbH of Germany, was the major producer with an open pit mine and plant at Chaillac. Barytine produced about 90,000 t/yr of flotation-grade barite averaging 98% barium sulfate, suitable for chemicals production.

Lafarge SA and Société Des Ciments Français were the two largest producers of cement in France. During the past several years, these two companies have been acquiring a number of companies domestically, as well as internationally. Each company has gained control of approximately one-third of the domestic market, leaving fewer than eight other companies holding the remaining one-third.

Société Générale de Recherches et d'Exploitations Minières (SOGEREM) was the main producer of fluorspar with three open pit mines in the south of France accounting for more than 60% of fluorspar production. The fluorspar vein deposits were found in Hercynian massifs, the Massif Central, the Vosges, the axial zone of the Pyrénées, and the outer Alps. SOGEREM's mining operations supplied Comifluor S.A., which operated a plant at Bastîde-a-Olette. This plant produced acid-grade fluorspar, 97% calcium fluoride, and electrical-grade fluorspar. Total production of both grades was about 45,000 t/yr. The Escardo Mine, owned by Denain-Anzin Minéraux, also shipped about 90,000 t/yr of crude ore from its surface mining operation to the Olette plant for processing (Marketing Dept, GMH, 1997).

France was one of Europe's largest producers of gypsum. Two-thirds of the production was from the Paris Basin. Four companies produced about 95% of the output. S.A. de Materiel de Construction, the largest company, accounted for almost one-half of the total gypsum produced.

Kaolin deposits derived from the granite massifs in Brittany were the most actively mined deposits in France. The largest mine, operated by La Source Compagnie Minière, was in the Kaolin d'Arvor deposit near Quessoy. The mine had a capacity of 300,000 t/yr. Plemet was another deposit in the northern area of Brittany. Société des Kaolins du Finistère's 30,000-t/yr operation at Berrien was bought by Kaolins de Moribihan of Groupe Minéral Harwanne. The kaolin was used mostly in the paper and the ceramic industries. Ball and refractory clays were mined in the Charante Basin to the southwest, which has produced more than 1 million metric tons to date (Marketing Dept, GMH, 1997).

Mines de Potasse d'Alsace S.A. (MDPA) was the principal producer of potash with two underground mines, Marie-Louise and Amélie, located near Mulhouse, Alsace. MDPA was the world's fifth- largest supplier of potash salts. The main products were potash ore, which was concentrated to 62% potassium oxide material, bromine, rock salt for snow clearing, and other industrial products, About 90% of the potash production was used by the agriculture industry for fertilizer, and 10% was purified and treated for use in other industries.

Although the deposit had estimated reserves to last into the early part of the next century, future development would be constrained to the east, west, and south by the boundaries of the tilted potash beds and to the north by the depth of the deposit.

Morton International of the United States was planning to move into the European market with the purchase of Cie. Des Salins du Midi et des Salines de l'Est. Morton was expected to pay about $290 million for the French company. This acquisition would be the company's first international move. Morton was the leading salt producer in Canada and the United States (Mining Engineering, 1997).

Talc de Luzenac S.A. was significant not only to the domestic market, but also to the European market. The company has acquired several talc-mining interests worldwide. Borax Français S.A., a subsidiary of Rio Tinto Corp., subsequently purchased 92% of Talc de Luzenac. As a result of mergers and acquisitions during the past 6 years, the Luzenac Group was formed as a subsidiary of Rio Tinto. Luzenac operated 16 deposits and 20 processing plants in Europe and North America and was the leading talc producer in the world.

Talc de Luzenac's open pit Trimouns Mine, located in the French Pyrenees 130 kilometers (km) south of Toulouse where the company has been mining since 1905, was the largest working talc deposit in the world. Production was more than 300,000 t/yr of ore, from which more than 40 different grades of talc are derived. Because of the altitude of 1,700 meters, with a mountain-top climate, Trimouns can only be worked from May to October. In terms of estimated reserves, the deposit could possibly support the current output for another 100 years (Jones and Vinandy, 1997).

All underground coal mines were closed in the Midi-Pyrénées region in southern France and in the Nord Pas-de-Calais Basin. CdF was proceeding with further rationalizations, resulting in reduced production. The rest of the mines, except in Lorraine region, were expected to close between 1997 and 2000. The mines in Lorraine were expected to close after 2000. CdF envisioned the final stoppage of all coal mining in France by 2005.

In 1997, onshore petroleum production was mainly from the Paris and the Aquitaine Basins. Because production had started to decline in these areas, the Government was planning to initiate a program to encourage exploration for new deposits in other areas thought to have potential; the Jura Basin was one area under consideration.

Five companies were operating refineries in France—Elf, Total, Royal Dutch/Shell Group, British Petroleum Co. PLC, and Mobil Corp. The structure of the industry was geared to gasoline production. Refining was mainly focused on high-octane unleaded gasoline used by a majority of the vehicles in France.

No refining units have been capable of processing heavy fuels nor were there any hydrocracked feedstocks available for the production of gas oil, thus leaving the process stream short on middle distillates and naphtha. France was a net importer of petroleum products.

One of the most significant infrastructure developments in recent years has been the Channel Tunnel Project. The tunnel, constructed underneath the English Channel, connected Coquelles, near Calais, France, and Folkestone, England. Transportation, not only in France, but also in the whole of Europe, has changed significantly from the operation of the Channel Tunnel. From these terminals, people drive their vehicles onto trains transporting them 49 km to the other side in about one-half hour. Trains are also used to transport freight. The Channel Tunnel connecting the two countries is a vital infrastructure component within the EU.

Having one of the world's most-developed economies, France was an advocate for the EU and the European single-market concept. The country has had to make considerable changes in the structure of its industries, particularly those mineral industries controlled by the state. Several state-owned companies have taken the initiative to become leaders in their respective industries. Others have been forced to make additional adjustments under rationalization schemes proposed by the EU or the French Government. The depletion of natural resources and/or the cessation of subsidies for uneconomic operations has had impacts on local communities and their economies. France will have the advantage of plentiful electrical power to attract industrial facilities requiring skilled work forces and will have better access to markets in Europe.

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Avenue de Concyr - BP 6009
45060 Orleans, cedex 2
FRANCE
Ministere de Industrie
DGEMP SMPSS
101 Rue de Grenelle
75353 Paris
FRANCE

TABLE 1
FRANCE: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/		1993	1994	1995	1996	1997 e/
METALS						
Aluminum:						
Bauxite, gross weight	thousand tons	151	128	75	81	164 3/ 4/
Alumina:						
Crude	do.	476	438	519	542 r/	400
Calcined	do.	367	344	425	352	350
Metal:						
Primary	do.	426	438	372	386	399 3/
Secondary	do.	222	228	231	236 r/	232 3/
Antimony metal, including regulus		848	750	680	520	500
Cadmium metal		137	6	–	205 r/	309 3/
Cobalt metal:						
Powder		222	310	330	580	500
Chloride		144	146	161	174	159 3/
Copper:						
Mine output, Cu content		72	174	172	– r/	–
Metal:						
Blister, secondary e/		5,900	4,400	2,580	2,300 r/	2,400
Refined:						
Primary		21,100	16,600	4,200	10,500 r/	5,800
Secondary e/		23,300	25,200	38,240	28,600 r/	23,500
Total		44,400	41,800	42,440	39,100	29,300
Gold, mine output, Au content	kilograms	2,155	5,078 r/	4,615	5,651 r/	5,700
Iron and steel:						
Iron ore and concentrates:						
Gross weight	thousand tons	3,518	2,420	1,496	1,464	500
Fe content	do.	1,055	706	432	430	145
Metal:						
Pig iron	do.	12,679	13,293	12,860	12,108 r/	13,424 3/
Ferroalloys:						
Blast furnace, spiegeleisen and ferromanganese		300	294	304	281	326 3/
Electric furnace:						
Ferromanganese	do.	57	66	46 r/	65 r/	60
Ferrosilicon	do.	39	112	108	130	125
Silicon metal	do.	59	66	71	74	70
Other (Si, Ca, Mg)	do.	29	20	124	114	100
Total		484	558	653 r/	664 r/	681 3/
Steel ingots and castings	do.	17,179	18,028	18,096	17,630	19,773 3/
Semimanufactures	do.	14,767	16,205	16,164	15,189 r/	16,587 3/
Lead: e/						
Smelter:						
Primary		112,281 3/	–	–	–	–
Secondary		25,000	185,000	247,700	241,100	225,000
Total		137,281	185,000	247,700	241,100	225,000
Refined:						
Primary		112,300	105,346 3/	128,708 3/	140,750 r/	138,500 3/
Secondary		156,000 r/	155,200 3/	168,000 r/	162,000 r/	162,600 3/
Total		268,300	260,546 3/	296,708	293,850	301,100 3/
Magnesium metal, including secondary		10,982	12,280	14,450	14,000	12,000
Nickel metal 5/		9,120	8,841 r/	9,106 r/	10,167 r/	9,701 3/
Silver: e/						
Mine output, Ag content:		–	–	1,167 3/	1,550	1,500
Lead and zinc concentrates	kilograms	9,000	–	–	–	–
Mixed copper, gold, silver concentrates	do.	1,100	640	–	–	–
Total	do.	10,100	640	1,167	1,550	1,500
Metal, Ag content of final smelter products		12,000	921 3/	666 3/	650	600
Tin, secondary, smelter output of solder and other alloys	do.	3,439	2,700 e/	3,020	4,410	4,000
Uranium:						
Mine output, U content		1,774	1,315	857	841	580 3/
Chemical concentrate, U3O8 equivalent		1,539	1,245	728	713	487 3/

See footnotes at end of table.

TABLE 1--Continued

FRANCE: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/		1993	1994	1995	1996	1997 e/
METALS--Continued:						
Zinc:						
Mine output, Zn content		13,834	1,000 e/	--	--	--
Metal including secondary:						
Slab		309,800	306,000 e/	300,400	324,300 r/	317,151 3/
Dust e/		9,000	10,000	28,000	26,800	26,000
INDUSTRIAL MINERALS						
Barite		67,200	72,100	75,450	76,000	75,000
Bromine, elemental e/		2,290	2,190	2,260	2,020	2,000
Cement, hydraulic	thousand tons	19,320	21,296	19,692	18,340	18,600
Clays:						
Bentonite e/ 6/		6,000	5,000	--	--	--
Kaolin and kaolinitic clay (marketable)	thousand tons	295	327	345	326	300
Refractory clay, unspecified	do.	7	8	15	14	12
Diamonds, synthetic, industrial e/	thousand carats	3,500	3,600	3,800	3,500	3,600
Diatomite e/	thousand tons	85	90	80	80	80
Feldspar, crude e/	do.	274	390	632	546	550
Fluorspar:						
Crude	do.	185	351	352	295	300
Marketable:						
Acid and ceramic-grade	do.	96	105	102	78	80
Metallurgical-grade	do.	20	26	28	33	30
Total	do.	116	131	130	111	110
Gypsum and anhydrite, crude	do.	5,000	5,200	4,800	4,550	4,600
Kyanite, andalusite, related materials e/	do.	50	60	80	80	75
Lime, quicklime, hydrated lime, dead-burned dolomite e/	do.	3,000	3,015	2,940	2,714	2,800
Mica e/		8,000	10,000	10,000	10,000	10,000
Nitrogen, N content of ammonia	thousand tons	1,871	1,480	1,470	1,850	1,800
Pigments, mineral, natural: Iron oxide e/		1,000	1,000	1,000	800	1,000
Phosphates, Thomas slag	thousand tons	300	154	140	77	80
Potash:						
Gross weight (run-of-mine)	do.	8,200	6,380	6,157	6,160	6,000
K2O equivalent (run-of-mine) e/	do.	1,100	936	869	812	800
K2O equivalent (marketable)	do.	890	870	799	760	700
Pozzolan and lapilli e/	do.	526	490	427	400	400
Salt:						
Rock salt e/	do.	116 3/	143 3/	165	160 r/	160
Brine salt (refined)	do.	1,310	1,658	1,491	1,460	1,400
Marine salt	do.	1,200	1,123	1,473	970	900
Salt in solution	do.	4,355	4,612	4,410	4,273	4,300
Total e/	do.	6,981	7,536	7,539	6,863 r/	6,760
Sodium compounds: e/						
Soda ash	do.	1,222	1,123	1,120	1,106	1,100
Sodium sulfate	do.	62	104	117	124	125
Stone, sand and gravel:						
Limestone, agricultural and industrial e/	do.	5,800	6,410	9,780	9,200	9,600
Slate, roof e/	do.	26	25	27	26	25
Sand and and gravel: e/						
Industrial sands, total	do.	5,400	7,240	6,100	6,550	6,500
Other sand, gravel and aggregates	do.	333,200	353,600	174,900	158,650	160,000
Sulfur, byproduct:						
Of natural gas	thousand tons	829	865	825	755	797 3/
Of petroleum	do.	278	219	240	235	210
Of unspecified sources e/	do.	150	100	106 3/	99 3/	100
Total e/	do.	1,257	1,184	1,171	1,089	1,017
Talc:						
Crude		299,900	306,300	322,300	349,270	330,000
Powder e/		225,000	277,800	297,300	320,970	300,000
MINERAL FUELS AND RELATED MATERIALS						
Asphaltic material e/		40,100	38,400	32,300	28,500	30,000
Carbon black e/		204,900	200,000	259,000	246,500	250,000

See footnotes at end of table.

TABLE 1--Continued

FRANCE: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/		1993	1994	1995	1996	1997 e/
MINERAL FUELS AND RELATED MATERIALS--Continued						
Coal, including briquets:						
Anthracite and bituminous	thousand tons	8,676	8,040	7,014	7,312	5,779 3/
Lignite	do.	1,670	1,500	1,402	939 r/	1,200
Total	do.	10,346	9,540	8,416	8,251 r/	6,979
Briquets e/	do.	500	336	276	250	250
Coke, metallurgical	do.	4,752	4,504	5,447	3,850	3,900
Gas, natural:						
Gross	million cubic meters	3,300	3,500	3,300	2,800	3,000
Marketed	do.	2,520	3,610	2,830 r/	3,115 r/	2,800
Petroleum:						
Crude	thousand 42-gallon barrels	20,039	20,384	18,284	15,339	13,104 3/
Refinery products e/:						
Liquefied petroleum gas	do.	31,262 3/	28,861 3/	30,000	32,155 r/ 3/	34,324 3/
Gasoline, all kinds	do.	149,438 3/	146,947 3/	148,000	141,524 r/ 3/	145,954 3/
Jet fuel	do.	43,672 3/	46,965 3/	45,000	45,000	53,656 3/
Kerosene	do.	500	500	500	500	500
Distillate fuel oil	do.	200,000	200,000	200,000	200,000	200,000
Heavy fuel oil	do.	76,000	79,322 3/	78,000	78,000	76,000
Other products	do.	40,000	40,000	40,000	40,000	40,000
Refinery fuel and losses	do.	20,000	20,000	20,000	20,000	20,000
Total e/	do.	560,872	562,595	561,500	563,500	570,434

e/ Estimated. r/ Revised.

1/ Table includes data available through May 1998.

2/ In addition to the commodities listed, France also produces germanium from domestic ores and has been described as the world's leading producer of this commodity in French resources. Unfortunately, actual output is not regularly reported. In addition, France produces large amounts of stone, but statistics on output are not reported.

3/ Reported figure.

4/ Reprocessed bauxite, not for metallurgical use.

5/ Excludes secondary production from nickel/cadmium batteries.

6/ Includes smectic clay.

TABLE 2
FRANCE: BALANCE OF PAYMENTS, SELECTED MINERAL COMMODITIES in 1996 1/

(Thousand dollars)

Commodity	Exports to EU	Imports from EU	Net gain or (loss)	Exports to the world	Imports from the world	Net gain or (loss)
Crude industrial minerals:						
Feldspar	7,835	2,454	5,381	8,625	7,229	1,396
Magnesite	42	545	(503)	99	599	(500)
Slate	3,277	8,991	(5,714)	3,601	9,030	(5,429)
Other	510,059	457,962	52,097	681,559	744,664	(63,105)
Total	521,213	469,952	51,261	693,884	761,522	(67,638)
Metalliferous ores:						
Copper	409	1,855	(1,446)	421	1,928	(1,507)
Lead	6	30,111	(30,105)	7	70,261	(70,254)
Tin	--	386	(386)	2	386	(384)
Zinc	2,363	63,646	(61,283)	2,366	167,472	(165,106)
Other (including waste and scrap)	998,111	517,906	480,205	1,134,702	1,449,594	(314,892)
Total	1,000,889	613,904	386,985	1,137,498	1,689,641	(552,143)
Metals:						
Iron and steel 2/	6,752,495	6,956,614	(204,119)	9,818,638	7,765,056	2,053,582
Mercury	132	237	(105)	233	328	(95)
Other nonferrous metals	3,455,899	3,402,764	53,135	4,621,906	5,762,179	(1,140,273)
Total	10,208,526	10,359,615	(151,089)	14,440,777	13,527,563	913,214
Mineral fuels	4,491,741	6,099,409	(1,607,668)	7,229,996	22,762,218	(15,532,222)
Nonmetallic mineral manufactures:						
Abrasives, n.e.s., grinding and polishing wheels and stones	37,791	108,138	(70,347)	54,491	131,712	(77,221)
Cement	124,558	101,749	22,809	205,980	140,761	65,219
Diamond, natural, gem, not set or strung	13,208	134,572	(121,364)	107,107	238,381	(131,274)
Dimension stone, worked	82,239	188,848	(106,609)	126,216	197,472	(71,256)
Lime	43,426	19,777	23,649	47,704	19,853	27,851
Mica, worked including agglomerated splittings	4,986	3,544	1,442	11,597	7,521	4,076
Precious and semiprecious stones other than diamond:						
Natural	2,026	5,832	(3,806)	40,130	83,676	(43,546)
Synthetic	7,927	1,138	6,789	42,777	15,311	27,466
Total	316,161	563,598	(247,437)	636,002	834,687	(198,685)

1/ Table prepared by Glenn J. Wallace, International Data Unit.

2/ Excludes ferrous waste and scrap.

Source: United Nations Statistical Office (microfiche).

TABLE 3
FRANCE: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
METALS				
Akali and akaline-earth metals:				
Alkali metals		42	(2/)	Poland 36; Algeria 1; Belgium-Luxembourg 1.
Alkaline-earth metals		185	9	Germany 146; Algeria 12; Russia 7.
Aluminum:				
Ore and concentrate		11,744	1	United Kingdom 11,695; Belgium-Luxembourg 12; South Africa 12.
Oxides and hydroxides		210,378	10,087	Italy 76,603; Germany 20,230; United Kingdom 17,453.
Metal including alloys:				
Scrap		113,072	4,139	Italy 46,186; Germany 15,275; Netherlands 13,993.
Unwrought		282,490	917	Italy 97,953; Germany 46,697; Switzerland 35,088.
Semimanufactures		419,261	9,757	Germany 92,409; United Kingdom 76,376; Italy 42,959.
Antimony, metal including alloys, all forms		390	--	Belgium-Luxembourg 312; Netherlands 68; Morocco 7.
Beryllium, metal including alloys, all forms	value, thousands	$161	$41	Brazil $57; United Arab Emirates $25; India $16.
Bismuth, metal including alloys, all forms		78	--	Republic of Korea 37; United Kingdom 20; Belgium-Luxembourg 17.
Cadmium, metal including alloys, all forms		925	--	Belgium-Luxembourg 520; Netherlands 280; Germany 89.
Chromium:				
Ore and concentrate		807	--	Italy 297; Spain 131; Saudi Arabia 100.
Oxides and hydroxides		477	--	United Kingdom 321; Belgium-Luxembourg 45; Spain 25.
Metal including alloys, all forms		3,264	1,678	Germany 489; United Kingdom 351; Japan 168.
Cobalt:				
Ore and concentrate	value, thousands	$17	--	Switzerland $13; Australia $3; Morocco $1.
Oxides and hydroxides		19	7	Belgium-Luxembourg 3; Italy 3; Germany 2.
Metal including alloys, all forms		469	77	Italy 89; United Kingdom 79; Germany 58.
Columbium and tantalum:				
Ore and concentrate 3/		24	--	Thailand 21; Iran 2; Germany 1.
Tantalum metal including alloys, all forms		80	25	Israel 53; United Kingdom 1.
Copper:				
Ore and concentrate		1,426	(2/)	Germany 842; Belgium-Luxembourg 584.
Matte and speiss including cement copper		226	--	Spain 210; Italy 15; Morocco 1.
Metal including alloys:				
Scrap		125,784	209	Italy 45,427; Germany 30,549; Belgium-Luxembourg 26,938.
Unwrought		26,166	2	Spain 9,496; Belgium-Luxembourg 5,489; United Kingdom 3,609.
Semimanufactures		435,946	14,639	Germany 121,145; Italy 74,457; Spain 41,993.
Germanium, metal including alloys, all forms		124	3	Germany 65; Italy 28; Belgium-Luxembourg 27.
Gold:				
Waste and sweepings	value, thousands	$18,456	--	United Kingdom $12,342; Switzerland $3,742; Canada $1,754.
Metal including alloys, unwrought and partly wrought	kilograms	50,749	42	United Kingdom 39,039; Switzerland 5,679; Italy 2,013.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	thousand tons	1,294	--	Belgium-Luxembourg 1,277; Italy 15; Netherlands 1.
Pyrite, roasted		1,267	--	Ghana 1,103; Peru 109; Singapore 55.
Metal:				
Scrap	thousand tons	3,746	(2/)	Spain 1,407; Belgium-Luxembourg 928; Italy 890.
Pig iron, cast iron, related materials		574,296	161,814	Germany 81,003; Italy 78,429; Belgium-Luxembourg 32,679.
Ferroalloys:				
Ferrochromium		951	8	Spain 555; Belgium-Luxembourg 263; Netherlands 64.
Ferromanganese		35,648	9,523	Germany 10,158; United Kingdom 4,429; Italy 3,364.
Ferronickel		25,408	(2/)	Italy 25,371; Belgium-Luxembourg 23; Switzerland 4.
Ferrosilicomanganese		41,465	7,492	Germany 7,838; Spain 4,796; Norway 3,900.
Ferrosilicon		30,550	421	Germany 13,838; Italy 9,671; Spain 1,460.
Silicon metal 4/		55	(2/)	Belgium-Luxembourg 37; Japan 12; French Polynesia 4

See footnotes at end of table.

TABLE 3--Continued
FRANCE: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

			Destinations	
Commodity		Total	United States	Other (principal)
METALS--Continued				
Iron and steel--Continued:				
Metal--Continued:				
Ferroalloys--Continued:				
Unspecified		40,023	4,779	Germany 9,409; Spain 4,084; Italy 3,965.
Steel, primary forms	value, thousands	$612,824	$46,274	Belgium-Luxembourg $430,231; Germany $45,350; Italy $33,184.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	thousand tons	4,487	652	Italy 1,162; Spain 884; Germany 480.
Clad, plated, coated	do.	2,232	47	Germany 542; Italy 313; United Kingdom 281.
Of alloy steel		778,058	59,370	Germany 160,275; Italy 157,616; Spain 48,456.
Bars, rods, angles, shapes, sections	thousand tons	2,824	117	Germany 1,056; Belgium-Luxembourg 413; Italy 269.
Rails and accessories		130,636	10,501	Belgium-Luxembourg 37,818; Brazil 14,698; Switzerland 9,027.
Wire		181,808	33,674	Germany 50,135; Belgium-Luxembourg 12,843; Spain 11,159.
Tubes, pipes, fittings	thousand tons	1,452	63	Germany 175; United Kingdom 113; Italy 85.
Lead:				
Ore and concentrate		3	--	Spain 2; Switzerland 1.
Oxides		14,378	3	Germany 7,558; Belgium-Luxembourg 3,177; Japan 1,843.
Metal including alloys:				
Scrap		12,339	--	Germany 4,058; Belgium-Luxembourg 1,982; Ireland 1,974.
Unwrought		105,801	--	Germany 49,039; Italy 22,502; Belgium-Luxembourg 14,051.
Semimanufactures		6,378	28	Belgium-Luxembourg 1,530; Germany 1,325; Netherlands 1,199.
Magnesium, metal including alloys:				
Scrap		526	3	Netherlands 206; United Kingdom 111; Norway 109.
Semimanufactures		28	1	Germany 20; Morocco 6; Belgium-Luxembourg 1.
Manganese:				
Ore and concentrate, metallurgical-grade		160,711	--	Norway 62,870; Italy 42,238; Poland 27,048.
Oxides and hydroxides		424	(2/)	Finland 98; Spain 96; Belgium-Luxembourg 57.
Metal including alloys, all forms		778	51	Germany 350; Italy 226; Belgium-Luxembourg 75.
Mercury	value, thousands	$233	$27	Belgium-Luxembourg $44; Netherlands $41; Italy $32.
Molybdenum:				
Ore and concentrate:				
Roasted		1	--	All to Spain.
Unroasted		50	--	India 49; Netherlands 1.
Metal including alloys:				
Unwrought including waste and scrap		5	--	Malaysia 3; United Kingdom 1.
Semimanufactures		103	9	Austria 37; Belgium-Luxembourg 34; Italy 5.
Nickel:				
Ore and concentrate		5	--	Belgium-Luxembourg 3; United Kingdom 1.
Matte and speiss		23	--	Netherlands 9; Germany 5; United Kingdom 4.
Metal including alloys:				
Scrap		4,519	936	Germany 2,069; United Kingdom 725; Belgium-Luxembourg 494.
Unwrought		7,470	1,513	Germany 2,300; Italy 611; Sweden 582.
Semimanufactures		7,553	1,032	Germany 3,967; United Kingdom 649; Italy 370.
Platinum-group metals:				
Waste and sweepings	value, thousands	$20,733	$642	United Kingdom $17,143; Germany $1,273; Norway $915.
Metal including alloys, unwrought and partly wrought	do.	$155,563	$1,698	United Kingdom $81,422; Japan $28,905; Spain $10,178.

See footnotes at end of table.

TABLE 3--Continued

FRANCE: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
METALS--Continued				
Silver:				
Ore and concentrate	do.	$3	--	All to Germany.
Metal including alloys, unwrought and partly wrought	do.	$183,456	$34	Spain $64,905; Germany $32,210; Switzerland $24,792.
Tin:				
Ore and concentrate		2	--	All to Morocco.
Metal including alloys:				
Scrap		1,375	--	Belgium-Luxembourg 1,182; Spain 103; Netherlands 67.
Unwrought		720	--	Spain 238; Belgium-Luxembourg 219; Germany 57.
Semimanufactures		1,210	34	Italy 584; Spain 186; Germany 152.
Titanium:				
Ore and concentrate		2,931	3	Netherlands 1,614; United Kingdom 1,246; Spain 54.
Oxides		19,343	5,639	Germany 3,232; Egypt 1,530; Italy 1,214.
Metal including alloys:				
Unwrought including waste and scrap		982	809	United Kingdom 151; Germany 17; Switzerland 2.
Semimanufactures		1,351	279	Germany 339; United Kingdom 303; Lebanon 83.
Tungsten:				
Ore and concentrate		20	--	Brazil 10; Spain 9; Morocco 1.
Metal including alloys:				
Unwrought including waste and scrap		332	29	Germany 124; Switzerland 52; United Kingdom 47.
Semimanufactures		73	8	United Kingdom 23; Germany 21; Mexico 3.
Uranium and thorium, metal including alloys, all forms:				
Uranium	value, thousands	$56,894	--	Japan $38,109; Germany $8,880; Sweden $7,772.
Thorium	do.	$4,375	$24	Russia $1,821; Germany $1,125; Belgium-Luxembourg $849.
Zinc:				
Ore and concentrate		10,146	--	Belgium-Luxembourg 6,270; Germany 3,022; Spain 852.
Oxides		20,344	(2/)	Spain 10,230; Belgium-Luxembourg 3,160; Italy 2,102.
Metal including alloys:				
Scrap		28,044	602	China 7,081; Italy 5,686; Belgium-Luxembourg 3,637.
Unwrought		232,120	--	Belgium-Luxembourg 140,199; Germany 39,674; Italy 17,022.
Semimanufactures 5/		58,002	277	Unspecified 51,518; United Kingdom 1,600; Italy 1,568.
Zirconium:				
Ore and concentrate		856	--	Italy 341; Germany 180; Spain 55.
Metal including alloys, unwrought including waste and scrap		7,060	558	Germany 2,558; Italy 665; United Kingdom 492.
Other:				
Ores and concentrates		130	--	Ghana 99; Switzerland 28; Germany 3.
Oxides and hydroxides		14,901	1,888	Germany 4,624; Italy 2,186; United Kingdom 1,356.
Ashes and residues		156,623	1,041	Belgium-Luxembourg 79,300; Norway 31,745; Italy 13,928.
Base metals including alloys, all forms		1,464	99	Italy 830; Finland 103; Russia 97.
Metalloids 6/	value, thousands	$292	$41	Germany $69; Italy $47; Japan $37.
Precious metals, n.e.s.:				
Ores and concentrates	do.	$942	--	United Kingdom $901; Germany $39; Morocco $2.
Waste and sweepings	do.	$46,941	$3,906	United Kingdom $28,514; Switzerland $7,183; Belgium-Luxembourg $3,788.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural corundum, emery, pumice, etc.		6,726	26	Algeria 3,402; Germany 1,464; Czech Republic 528.
Artificial corundum		30,175	779	Germany 6,143; Spain 4,361; Italy 4,254.
Dust and powder of precious and semiprecious stones including diamonds	value, thousands	$352	$83	Germany $69; Italy $47; Japan $37.
Grinding and polishing wheels and stones		6,106	101	Netherlands 1,344; Italy 974; Spain 860.
Asbestos, crude		14,054	32	Colombia 3,391; Belgium-Luxembourg 3,343; Portugal 2,941.
Barite and witherite	thousand tons	1,575	(2/)	Belgium-Luxembourg 1,385; Switzerland 91; Germany 72.

See footnotes at end of table.

TABLE 3--Continued
FRANCE: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

			Destinations	
Commodity		Total	United States	Other (principal)
INDUSTRIAL MINERALS--Continued				
Boron: Crude natural borates		1,258	--	Belgium-Luxembourg 1,159; Germany 77; Tunisia 10.
Bromine, fluorine, iodine		96	--	Germany 30; United Kingdom 23; United Arab Emirates 17.
Cement	thousand tons	1,921	60	Germany 438; Cote d' Ivoire 408; Italy 148.
Chalk		497,832	916	Germany 177,241; Belgium-Luxembourg 109,437; Netherlands 44,810.
Clays, crude:				
Bentonite		22,555	2	Spain 9,741; Portugal 3,953; Germany 2,799.
Kaolin		260,312	20	Italy 84,338; Spain 47,892; Germany 34,528.
Unspecified		468,494	401	Italy 279,405; Germany 56,855; United Kingdom 54,108.
Cryolite and chiolite		609	--	All to Switzerland.
Diamond, natural:				
Gem, not set or strung	value, thousands	$107,107	$31,536	Switzerland $54,229; Belgium-Luxembourg $9,680; Israel $3,214.
Industrial stones	do.	$385	--	Belgium-Luxembourg $331; Switzerland $49; Andorra $2.
Diatomite and other infusorial earth		34,684	23	Italy 8,410; Germany 5,409; United Kingdom 2,881.
Feldspar		92,887	--	Spain 47,272; Belgium-Luxembourg 18,169; Germany 13,627.
Fertilizer materials:				
Crude, n.e.s.		29,014	84	Switzerland 6,896; United Kingdom 3,866; Spain 3,499.
Manufactured:				
Ammonia		109,138	--	Spain 60,522; United Kingdom 19,965; Netherlands 10,024.
Nitrogenous		774,809	23,785	Germany 162,580; Netherlands 149,400; Spain 110,638.
Phosphatic		27,561	--	Spain 20,496; Belgium-Luxembourg 3,444; Italy 1,430.
Potassic		288,744	--	Belgium-Luxembourg 116,354; Italy 47,752; Netherlands 37,959.
Unspecified and mixed		482,607	100	Ireland 93,955; Spain 74,151; Germany 55,957.
Fluorspar		31,017	36	Tunisia 10,277; Italy 9,998; Turkey 3,626.
Graphite, natural		985	46	Belgium-Luxembourg 545; China 140; Spain 79.
Gypsum and plaster		847,816	--	Germany 391,072; Belgium-Luxembourg 363,145; Netherlands 19,778.
Lime		636,843	--	Germany 427,448; Finland 89,734; Belgium-Luxembourg 47,023.
Magnesium compounds:				
Magnesite, crude		80	--	Switzerland 21; Germany 18; Belgium-Luxembourg 16.
Oxides and hydroxides		22,288	49	Belgium-Luxembourg 7,810; Poland 4,252; United Kingdom 3,125.
Mica:				
Crude including splittings and waste		9,383	3	Germany 5,276; United Kingdom 1,357; Belgium-Luxembourg 584.
Worked including agglomerated splittings		1,210	51	Switzerland 635; Austria 145; United Kingdom 143.
Nitrates, crude		2	--	All to Belgium-Luxembourg.
Phosphates, crude		7,286	92	Spain 4,173; United Kingdom 1,796; Belgium-Luxembourg 522.
Pigments, mineral: Iron oxides and hydroxides, processed		11,814	6	Italy 3,628; Germany 2,294; Spain 1,213.
Potassium salts, crude		1	--	All to Morocco.
Precious and semiprecious stones other than diamond:				
Natural	value, thousands	$40,130	$636	Switzerland $32,160; Japan $1,763; Vietnam $1,508.
Synthetic	do.	$37,545	$1,618	Switzerland $19,024; Hong Kong $4,189; Thailand $2,231.
Pyrite, unroasted		94	--	Italy 71; Belgium-Luxembourg 23.
Quartz crystal, piezoelectric	value, thousands	$5,232	$36	Finland $2,964; United Kingdom $1,678; Germany $256.
Salt and brine		795,531	717	Italy 344,241; Germany 166,996; Belgium-Luxembourg 126,945.

See footnotes at end of table.

TABLE 3--Continued
FRANCE: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

		Destinations	
Commodity	Total	United States	Other (principal)
INDUSTRIAL MINERALS--Continued			
Sodium compounds, n.e.s., sulfate, manufactured	17,050	3	Italy 7,397; Belgium-Luxembourg 5,522; Germany 1,198.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	146,389	1,583	Belgium-Luxembourg 36,805; Germany 35,466; United Kingdom 23,525.
Worked	101,667	9,016	Belgium-Luxembourg 27,257; Germany 23,496; Switzerland 10,064.
Dolomite, chiefly refractory-grade	74,810	--	Belgium-Luxembourg 48,120; Netherlands 8,120; Germany 6,166.
Gravel and crushed rock thousand tons	9,109	13	Germany 3,334; Switzerland 2,827; Belgium-Luxembourg 1,258.
Limestone other than dimension	264,031	--	Germany 186,949; Norway 57,930; Belgium-Luxembourg 17,957.
Quartz and quartzite	474	--	Spain 249; Germany 77; Belgium-Luxembourg 47.
Sand other than metal-bearing thousand tons	4,373	2	Germany 2,225; Italy 693; Switzerland 638.
Sulfur:			
Elemental:			
Crude including native and byproduct	653,403	1,004	Morocco 174,150; Tunisia 146,661; United Kingdom 90,925.
Colloidal, precipitated, sublimed	813	38	Germany 327; Belgium-Luxembourg 136; Canada 102.
Dioxide	4,884	--	Netherlands 3,487; Germany 909; United Kingdom 194.
Sulfuric acid	297,351	--	Belgium-Luxembourg 232,234; United Kingdom 41,234; Netherlands 10,218.
Talc, steatite, soapstone, pyrophyllite	176,798	638	Germany 47,556; Spain 31,366; Italy 25,959.
Vermiculite, perlite, chlorite	1,881	5	Germany 685; Italy 339; Spain 226.
Other:			
Crude	27,482	130	Belgium-Luxembourg 10,469; Spain 8,887; Italy 1,989.
Slag and dross, not metal-bearing thousand tons	1,654	61	Belgium-Luxembourg 879; Israel 283; Germany 191.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	12,568	--	Belgium-Luxembourg 11,191; Germany 790; Switzerland 206.
Carbon, black	114,758	1	Germany 37,074; Spain 25,827; Italy 14,421.
Coal:			
Anthracite	27,368	--	Belgium-Luxembourg 13,323; Germany 11,482; Netherlands 1,490.
Bituminous	2,665	--	Norway 2,522; Belgium-Luxembourg 139; Germany 3.
Briquets of anthracite and bituminous coal	23,230	--	Belgium-Luxembourg 7,281; Germany 6,146; Netherlands 4,420.
Lignite including briquets	8,844	--	Netherlands 7,980; Germany 550; Belgium-Luxembourg 183.
Unspecified	259,759	--	Germany 220,833; Norway 22,710; Italy 11,817.
Coke and semicoke	341,548	--	Germany 86,520; Italy 62,839; Belgium-Luxembourg 61,387.
Gas, natural:			
Gaseous	472,014	--	Switzerland 220,298; Spain 146,462; Belgium-Luxembourg 105,240.
Liquefied	49,227	--	All to Spain.
Peat including briquets and litter	29,580	--	Belgium-Luxembourg 15,232; Germany 6,555; Italy 3,097.
Petroleum:			
Crude	24,874	--	Germany 24,417; Austria 446; Morocco 5.
Refinery products:			
Liquefied petroleum gas thousand tons	1,059	39	Italy 232; Morocco 231; United Kingdom 120.
Gasoline do.	5,111	637	Germany 1,292; Italy 705; United Kingdom 347.
Mineral jelly and wax	137,121	1,379	Germany 45,989; Netherlands 33,765; Belgium-Luxembourg 15,545.
Kerosene and jet fuel thousand tons	1,281	--	Switzerland 586; Germany 217; Belgium-Luxembourg 166.

See footnotes at end of table.

TABLE 3--Continued
FRANCE: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS--Continued				
Petroleum--Continued:				
Refinery products--Continued:				
Distillate fuel oil		2,533	--	Netherlands 2,370; Italy 90; Germany 61.
Lubricants	thousand tons	1,341	(2/)	Belgium-Luxembourg 247; Germany 144; United Kingdom 133.
Residual fuel oil	do.	6,276	408	Italy 869; United Kingdom 807; Germany 643.
Bitumen and other residues		525,187	--	Spain 101,830; United Kingdom 98,030; Portugal 70,573.
Bituminous mixtures		42,530	742	Germany 18,294; Algeria 4,846; Switzerland 3,954.
Petroleum coke		51,339	835	Belgium-Luxembourg 19,808; Netherlands 12,897; Denmark 7,399.

1/ Table prepared by Glenn J. Wallace.

2/ Less than 1/2 unit.

3/ May include vanadium.

4/ May include high-purity silicon.

5/ Includes zinc dust, flakes, and powders.

6/ Reported under SITC item number as "selenium, tellurium, phosphorus, arsenic, etc."

Source: United Nations Statistical Office (microfiche).

TABLE 4
FRANCE: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Sources	
			United States	Other (principal)
METALS				
Akali and akaline-earth metals:				
Alkali metals		3,072	74	Germany 1,655; United Kingdom 1,164; Italy 130.
Alkaline-earth metals		2,005	33	Russia 920; China 345; Belgium-Luxembourg 327.
Aluminum:				
Ore and concentrate	thousand tons	1,696	(2/)	Guinea 1,379; Greece 171; China 100.
Oxides and hydroxides		567,692	1,931	Jamaica 407,005; Greece 80,988; Germany 37,314.
Metal including alloys:				
Scrap		131,166	651	Germany 57,886; Belgium-Luxembourg 16,284; Netherlands 13,776.
Unwrought		491,124	95	Norway 95,151; Netherlands 86,474; Cameroon 62,079.
Semimanufactures		413,389	10,299	Germany 111,697; Belgium-Luxembourg 59,832; Italy 39,075.
Antimony, metal including alloys, all forms		5,705	6	China 4,941; Krgyzstan 570; Belgium-Luxembourg 89.
Beryllium, metal including alloys, all forms	value, thousands	$612	$458	United Kingdom $50; Germany $39; Russia $35.
Bismuth, metal including alloys, all forms		310	25	Belgium-Luxembourg 136; United Kingdom 88, Peru 57.
Cadmium, metal including alloys, all forms		823	7	Belgium-Luxembourg 616; Finland 100; United Kingdom 40.
Chromium:				
Ore and concentrate		29,513	--	South Africa 11,244; Belgium-Luxembourg 7,240; Albania 5,446.
Oxides and hydroxides		8,288	16	United Kingdom 5,563; Germany 1,592; Russia 628.
Metal including alloys, all forms		922	8	Russia 600; United Kingdom 172; Germany 79.
Cobalt:				
Ore and concentrate		30	(2/)	Belgium-Luxembourg 25; Netherlands 5.
Oxides and hydroxides		529	48	United Kingdom 196; Finland 161; Belgium-Luxembourg 59.
Metal including alloys, all forms		1,241	178	United Kingdom 205; Zambia 194; Germany 162.
Columbium and tantalum:				
Ore and concentrate 3/		432	1	Germany 431.
Tantalum metal including alloys, all forms		39	32	Germany 3; Italy 2; Belgium-Luxembourg 1.
Copper:				
Ore and concentrate	value, thousands	$195	--	Australia $69; Belgium-Luxembourg $61; Italy $54.
Matte and speiss including cement copper		1,039	1	Belgium-Luxembourg 1,011; Nertherlands 25; Italy 2.
Metal including alloys:				
Scrap		89,416	27	Germany 26,369; Algeria 10,501; United Kingdom 10,396.
Unwrought		477,146	319	Chile 172,914; Poland 84,096; Russia 54,597.
Semimanufactures		230,328	1,822	Germany 86,792; Belgium-Luxembourg 50,704; United Kingdom 19,537.
Germanium, metal including alloys, all forms		6	(2/)	Belgium-Luxembourg 5; Nertherlands 1.
Gold:				
Waste and sweepings	value, thousands	$2,388	--	Mauritius $1,874; Germany $213; Hungary $108.
Metal including alloys, unwrought and partly wrought	kilograms	84,718	46,842	United Kingdom 18,333; South Africa 6,400; Switzerland 4,002.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	thousand tons	18,305	(2/)	Brazil 6,576; Australia 5,063; Mauritania 2,901.
Pyrite, roasted		17,880	--	Spain 9,085; Italy 6,341; Belgium-Luxembourg 2,383.
Metal:				
Scrap	thousand tons	1,536	(2/)	Germany 1,022; Belgium-Luxembourg 345; United Kingdom 49.
Pig iron, cast iron, related materials		212,136	57	Russia 61,856; Belgium-Luxembourg 33,837; Germany 33,792.
Ferroalloys:				
Ferrochromium		207,060	467	South Africa 128,617; Kazakstan 9,214; Zimbabwe 8,946.

See footnotes at end of table.

TABLE 4--Continued
FRANCE: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity	Total	Sources	
		United States	Other (principal)
METALS--Continued			
Iron and steel--Continued:			
Metal--Continued:			
Ferroalloys--Continued:			
Ferromanganese	51,427	34	Norway 23,822; South Africa 13,479; Belgium-Luxembourg 9,853.
Ferronickel	62,867	1	New Caledonia 40,713; Colombia 11,616; Dominican Republic 8,782.
Ferrosilicochromium	182	--	Zimbabwe 102; Belgium-Luxembourg 80.
Ferrosilicomanganese	46,722	--	Belgium-Luxembourg 14,756; Norway 12,610; Spain 4,646.
Ferrosilicon	49,651	4	Norway 16,811; Belgium-Luxembourg 7,700; Germany 5,507.
Silicon metal 4/	18,765	68	Norway 5,561; Spain 3,668; Brazil 3,231.
Unspecified	26,660	1,263	Germany 5,803; United Kingdom 4,984; Belgium-Luxembourg 2,678.
Steel, primary forms	797,946	730	Belgium-Luxembourg 422,553; Germany 168,853; Spain 99,292.
Semimanufactures:			
Flat-rolled products:			
Of iron or nonalloy steel:			
Not clad, plated, coated thousand tons	4,250	(2/)	Belgium-Luxembourg 2,094; Germany 663; Italy 449.
Clad, plated, coated do.	1,521	16	Belgium-Luxembourg 674; Germany 306; Italy 149.
Of alloy steel	564,683	1,027	Belgium-Luxembourg 232,144; Germany 152,242; Spain 44,329.
Bars, rods, angles, shapes, sections thousand tons	2,808	1	Belgium-Luxembourg 849; Germany 607; Italy 583.
Rails and accessories	22,903	11	Germany 8,635; Belgium-Luxembourg 7,489; United Kingdom 5,492.
Wire	365,060	706	Belgium-Luxembourg 96,233; Germany 79,106; Italy 76,917.
Tubes, pipes, fittings	941,389	5,956	Italy 325,836; Germany 219,722; Belgium-Luxembourg 86,095.
Lead:			
Ore and concentrate	205,018	34,395	Sweden 39,070; South Africa 38,778; Ireland 35,898.
Oxides	1,890	1	Germany 1,182; Italy 307; United Kingdom 115.
Metal including alloys:			
Scrap	34,761	--	Belgium-Luxembourg 17,675; Switzerland 9,061; Germany 3,068.
Unwrought	57,125	17	United Kingdom 20,868; Belgium-Luxembourg 13,150; Mexico 8,010.
Semimanufactures	8,614	4	Belgium-Luxembourg 5,134; Germany 3,274; Italy 124.
Magnesium, metal including alloys:			
Scrap	118	--	Italy 54; Germany 40; Belgium-Luxembourg 24.
Unwrought	6,218	1,428	Norway 3,605; Canada 230; Belgium-Luxembourg 227.
Semimanufactures	1,137	41	Austria 280; Belgium-Luxembourg 216; Germany 174.
Manganese:			
Ore and concentrate, metallurgical-grade thousand tons	1,111	(2/)	Gabon 729; Brazil 183; South Africa 161.
Oxides and hydroxides	7,621	58	Greece 2,084; Brazil 1,668; Belgium-Luxembourg 1,325.
Metal including alloys, all forms	5,720	722	Netherlands 2,313; South Africa 768; Russia 481.
Mercury	67	10	Spain 23; Netherlands 9; Croatia 6.
Molybdenum:			
Ore and concentrate:			
Roasted	2,367	300	Belgium-Luxembourg 747; Chile 655; Nertherlands 302.
Unroasted	11	--	All from Italy.
Metal including alloys:			
Unwrought including waste and scrap	256	62	Germany 130; Netherlands 21; Chile 20.
Semimanufactures	172	59	Austria 86; Germany 15; Belgium-Luxembourg 5.

See footnotes at end of table.

TABLE 4--Continued
FRANCE: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Sources	
			United States	Other (principal)
METALS--Continued				
Nickel:				
Ore and concentrate		582	4	New Caledonia 336; Belgium-Luxembourg 120; Brazil 85.
Matte and speiss		16,368	--	New Caledonia 14,280; United Kingdom 1,063; Russia 423.
Metal including alloys:				
Scrap		1,500	702	Germany 346; Russia 106; Netherlands 79.
Unwrought		31,329	1,005	Russia 11,049; Australia 5,626; Germany 3,935.
Semimanufactures		8,146	2,943	United Kingdom 2,238; Germany 1,653; Sweden 308.
Platinum-group metals:				
Waste and sweepings	value, thousands	$8,126	--	Bulgaria $3,639; Japan $1,348; Tunisia $908.
Metal including alloys, unwrought and partly wrought	do.	$220,141	$7,560	United Kingdom $156,679; South Africa $14,781; Spain $9,783.
Silver:				
Ore and concentrate	do.	$24	--	Belgium-Luxembourg $16; Germany $8.
Metal including alloys, unwrought and partly wrought	do.	$330,984	$6,224	United Kingdom $111,004; Belgium-Luxembourg $106,890; Spain $36,244.
Tin:				
Ore and concentrate		447	--	Germany 436; United Kingdom 6; Netherlands 4.
Metal including alloys:				
Scrap		487	--	Netherlands 294; Belgium-Luxembourg 184; Tunisia 3.
Unwrought		8,772	--	Indonesia 2,786; Belgium-Luxembourg 1,346; China 1,258.
Semimanufactures		328	3	Germany 115; Netherlands 93; Spain 44.
Titanium:				
Ore and concentrate		154,628	(2/)	Norway 67,816; Australia 47,010; Canada 33,486.
Oxides		11,464	423	United Kingdom 2,070; Belgium-Luxembourg 1,611; Slovenia 1,549.
Metal including alloys:				
Unwrought including waste and scrap		1,947	159	Russia 653; Japan 647; United Kingdom 151.
Semimanufactures		2,881	1,395	United Kingdom 484; Japan 300; Italy 184.
Tungsten:				
Ore and concentrate		1,750	--	Brazil 1,741; Germany 4; Belgium-Luxembourg 1.
Metal including alloys:				
Unwrought including waste and scrap		499	9	China 357; Austria 67; Belgium-Luxembourg 17.
Semimanufactures		96	8	Germany 32; Belgium-Luxembourg 20; Italy 15.
Uranium and thorium:				
Uranium ore and concentrate	value, thousands	$4	--	All from Spain.
Metal including alloys, all forms:				
Uranium	do.	$377,785	$7,530	Unspecified $263,467; Russia $49,544; South Africa $22,006.
Thorium	do.	$4,444	$4,406	Belgium-Luxembourg $26; Germany $3; United Kingdom $2.
Zinc:				
Ore and concentrate		601,108	21	Peru 133,885; Belgium-Luxembourg 127,903; Bolivia 93,369.
Oxides		15,818	11	Germany 3,739; Netherlands 3,104; Belgium-Luxembourg 2,919.
Metal including alloys:				
Scrap		11,921	--	Belgium-Luxembourg 6,022; Germany 3,633; Netherlands 1,562.
Unwrought including waste and scrap		157,099	7	Belgium-Luxembourg 46,883; Netherlands 26,958; Spain 22,783.
Semimanufactures 5/		30,972	29	Belgium-Luxembourg 14,208; Germany 9,976; Italy 2,594.
Zirconium:				
Ore and concentrate		63,504	1,004	Australia 30,658; South Africa 28,808; Ukraine 1,534.

See footnotes at end of table.

TABLE 4--Continued
FRANCE: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Sources	
			United States	Other (principal)
METALS--Continued				
Zirconium--Continued:				
Metal including alloys:				
Unwrought including waste and scrap		33	2	Japan 17; China 7; Italy 3.
Semimanufactures		106	55	Belgium-Luxembourg 28; United Kingdom 10; Germany 9.
Other:				
Ores and concentrates		14,150	--	Norway 13,241; Italy 350; Guatemala 260.
Oxides and hydroxides		5,455	403	Spain 1,257; Belgium-Luxembourg 894; Germany 739.
Ashes and residues		72,036	1,397	Germany 39,649; Belgium-Luxembourg 13,977; Spain 3,485.
Base metals including alloys, all forms		108	25	Belgium-Luxembourg 45; Germany 23; Russia 8.
Metalloids 6/		11,751	43	Netherlands 11,456; Belgium-Luxembourg 59; Spain 51.
Precious metals, n.e.s.:				
Ores and concentrates	value, thousands	$301	--	Greece $190; Spain $52; Bolivia $45.
Waste and sweepings	do.	$2,344	--	Belgium-Luxembourg $658; Switzerland $536; Sweden $409.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural corundum, emery, pumice, etc.		6,893	563	Turkey 2,192; Italy 1,034; Germany 958.
Artificial corundum		24,621	193	Belgium-Luxembourg 5,894; China 4,386; United Kingdom 3,795.
Dust and powder of precious and semiprecious stones including diamonds	value, thousands	$7,070	$1,854	Ireland $2,474; Germany $1,408; Belgium-Luxembourg $519.
Grinding and polishing wheels and stones		13,551	240	Italy 3,385; Germany 3,244; Belgium-Luxembourg 1,456.
Asbestos, crude		20,544	7	Canada 14,155; South Africa 2,874; Russia 1,934.
Barite and witherite		17,624	430	China 7,347; Netherlands 4,306; Germany 3,839.
Boron:				
Crude natural borates		49,286	--	Turkey 47,281; United Kingdom 1,110; Belgium-Luxembourg 793.
Oxides and acids		19,129	4,095	Italy 9,313; Belgium-Luxembourg 2,334; Turkey 2,108.
Bromine, fluorine, iodine		11,012	54	Israel 7,967; Netherlands 1,081; Japan 671.
Cement	thousand tons	1,741	(2/)	Belgium-Luxembourg 468; Turkey 271; Spain 247.
Chalk		58,897	2	Germany 40,729; Belgium-Luxembourg 5,203; Spain 4,352.
Clays, crude:				
Bentonite		87,252	7,294	Italy 31,786; Greece 17,102; Germany 12,922.
Kaolin		391,595	57,882	United Kingdom 200,169; Brazil 41,533; Belgium-Luxembourg 39,868.
Unspecified		342,461	7,269	Germany 247,068; Senegal 40,483; Spain 14,310.
Cryolite and chiolite		5	--	Mainly from United Kingdom.
Diamond, natural:				
Gem, not set or strung	value, thousands	$238,381	$36,074	Belgium-Luxembourg $76,184; Switzerland $55,680; Israel $30,334.
Industrial stones	do.	$4,702	$5	Belgium-Luxembourg $3,094; Germany $573; Netherlands $268.
Diatomite and other infusorial earth		13,736	4,509	Germany 4,064; Denmark 2,517; Belgium-Luxembourg 1,031.
Feldspar		66,473	3	Norway 30,998; Germany 21,004; Netherlands 6,035.
Fertilizer materials:				
Crude, n.e.s.		108,131	58	Belgium-Luxembourg 49,729; Netherlands 34,069; Italy 15,090.
Manufactured:				
Ammonia		546,685	30	Netherlands 136,498; Germany 100,234; Estonia 80,171.

See footnotes at end of table.

TABLE 4--Continued
FRANCE: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Sources	
			United States	Other (principal)
INDUSTRIAL MINERALS--Continued				
Fertilizer materials--Continued:				
Manufactured--Continued:				
Nitrogenous	thousand tons	4,047	27	Netherlands 952; Belgium-Luxembourg 923; Russia 458.
Phosphatic		676,044	--	Belgium-Luxembourg 241,021; Netherlands 108,461; Tunisia 101,512.
Potassic	thousand tons	1,620	29	Spain 574; United Kingdom 351; Germany 279.
Unspecified and mixed	do.	1,825	27	Belgium-Luxembourg 657; Netherlands 342; Morocco 176.
Fluorspar		4,355	1	Mexico 3,312; United Kingdom 566; China 391.
Graphite, natural		3,869	18	Germany 1,024; Netherlands 616; United Kingdom 385.
Gypsum and plaster		217,524	1,809	Germany 127,492; Netherlands 23,433; Switzerland 22,163.
Lime		252,210	163	Belgium-Luxembourg 97,320; Germany 91,321; Spain 35,150.
Magnesium compounds:				
Magnesite, crude		3,655	2	Spain 1,828; Germany 823; Turkey 528.
Oxides and hydroxides		186,568	1,876	Spain 34,721; North Korea 34,046; Greece 27,209.
Mica:				
Crude including splittings and waste		4,516	104	India 2,076; Brazil 860; China 481.
Worked including agglomerated splittings		452	16	Switzerland 118; Argentina 80; Belgium-Luxembourg 77.
Nitrates, crude		13,986	--	Belgium-Luxembourg 8,833; Germany 3,563; Chile 485.
Phosphates, crude	thousand tons	1,706	5	Israel 678; Morocco 360; Tunisia 279.
Pigments, mineral, iron oxides and hydroxides, processed		39,316	398	Germany 12,936; Italy 8,501; Belgium-Luxembourg 4,132.
Potassium salts, crude		40,346	--	Israel 29,840; Canada 5,582; Jordan 4,005.
Precious and semiprecious stones other than diamond:				
Natural	value, thousands	$83,676	$2,906	Switzerland $44,459; Thailand $15,371; Germany $3,402.
Synthetic	do.	$11,131	$1,055	Switzerland $4,751; Mauritius $3,049; Germany $708.
Pyrite, unroasted		4,888	--	Italy 3,428; Belgium-Luxembourg 1,301; Netherlands 78.
Quartz crystal, piezoelectric	value, thousands	$4,180	$3,256	Russia $366; Japan $306; United Kingdom $69.
Salt and brine		451,257	156	Spain 135,020; Germany 102,376; United Kingdom 57,005.
Sodium compounds, n.e.s.:				
Soda ash, manufactured		259,130	15,316	Bulgaria 67,668; Poland 62,830; Germany 53,721.
Sulfate, manufactured		111,710	19	Spain 52,984; Belgium-Luxembourg 50,518; Germany 3,253.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked		285,558	271	South Africa 50,676; Brazil 45,742; India 35,747.
Worked		396,344	135	Spain 199,221; Germany 68,822; Italy 59,921.
Dolomite, chiefly refractory-grade		276,804	--	Belgium-Luxembourg 212,894; Italy 34,545; Germany 17,071.
Gravel and crushed rock	thousand tons	5,827	(2/)	Belgium-Luxembourg 4,152; United Kingdom 640; Germany 606.
Limestone other than dimension		172,773	--	Belgium-Luxembourg 172,718; Germany 52; Denmark 3.
Quartz and quartzite		263,519	373	Belgium-Luxembourg 239,329; Spain 13,988; Italy 4,633.
Sand other than metal-bearing	thousand tons	1,626	1	Belgium-Luxembourg 912; United Kingdom 445; Germany 112.

See footnotes at end of table.

TABLE 4--Continued
FRANCE: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

			Sources	
Commodity		Total	United States	Other (principal)
INDUSTRIAL MINERALS--Continued				
Sulfur:				
Elemental:				
Crude including native and byproduct		122,495	–	Poland 55,917; Germany 36,662; Netherlands 19,787.
Colloidal, precipitated, sublimed		17,801	9	Germany 14,734; Spain 1,513; Australia 577.
Dioxide		2,735	4	Sweden 1,534; Italy 1,012; Germany 179.
Sulfuric acid		251,840	9	Belgium-Luxembourg 96,037; Germany 38,141; Spain 34,348.
Talc, steatite, soapstone, pyrophyllite		31,587	790	Finland 6,724; Belgium-Luxembourg 6,258; Italy 5,631.
Vermiculite, perlite, chlorite		107,397	33	Switzerland 25,374; Turkey 25,020; Greece 19,440.
Other:				
Crude	thousand tons	2,007	2	Switzerland 1,207; Germany 238; Spain 213.
Slag and dross, not metal-bearing	do.	1,353	2	Germany 847; Belgium-Luxembourg 303; Canada 160.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural		76,658	1,540	Belgium-Luxembourg 71,921; Germany 2,796; Italy 203.
Carbon, black		118,661	1,964	Netherlands 30,462; Germany 27,247; Italy 16,819.
Coal:				
Anthracite	thousand tons	1,390	6	China 377; South Africa 372; United Kingdom 174.
Bituminous	do.	14,281	4,342	Australia 2,484; South Africa 2,197; Colombia 1,957.
Briquets of anthracite and bituminous coal		81,583	399	Germany 54,391; Italy 20,333; Belgium-Luxembourg 5,969.
Lignite including briquets		70,712	–	Germany 70,533; Belgium-Luxembourg 125; United Kingdom 50.
Unspecified	thousand tons	85	58	Colombia 14; Germany 11; United Kingdom 1.
Coke and semicoke		810,590	–	China 228,811; Netherlands 222,525; Belgium-Luxembourg 128,045.
Gas, natural:				
Gaseous	thousand tons	20,880	–	Russia 8,451; Norway 7,775; Netherlands 4,653.
Liquefied	do.	4,910	–	Algeria 4,827; United Arab Emirates 83.
Peat including briquets and litter		426,519	117	Germany 204,716; Netherlands 64,058; Belgium-Luxembourg 60,286.
Petroleum:				
Crude	thousand tons	83,131	–	Saudi Arabia 18,788; Norway 14,337; United Kingdom 13,677.
Refinery products:				
Liquefied petroleum gas	do.	1,702	1	United Kingdom 711; Algeria 284; Saudi Arabia 268.
Gasoline	do.	6,792	8	Algeria 1,222; United Kingdom 939; Belgium-Luxembourg 711.
Mineral jelly and wax		75,725	15,100	Germany 17,748; Netherlands 16,828; United Kingdom 7,917.
Kerosene and jet fuel		617,111	36,836	Bahrain 108,696; Netherlands Antilles 91,876; Algeria 91,328.
Distillate fuel oil		67,703	–	Russia 49,073; Netherlands 9,486; Malaysia 5,011.
Lubricants		250,637	6,647	Belgium-Luxembourg 80,415; Netherlands 34,873; Germany 33,272.
Residual fuel oil	thousand tons	14,291	245	Russia 3,463; United Kingdom 2,049; Netherlands 1,966.
Bitumen and other residues		579,183	62,773	Belgium-Luxembourg 167,770; Spain 128,778; Germany 94,919.
Bituminous mixtures		28,759	15	Belgium-Luxembourg 20,149; Germany 2,929; Spain 2,505.
Petroleum coke	thousand tons	1,536	1,055	Belgium-Luxembourg 191; Germany 119; United Kingdom 71.

1/ Table prepared by Glenn J. Wallace.

2/ Less than 1/2 unit.

3/ May include vanadium.

4/ May include high-purity silicon.

TABLE 4--Continued
FRANCE: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity	Total	Sources United States	Other (principal)

5/ Includes zinc dust, flakes, and powders.
6/ Reported under SITC item number as "selenium, tellurium, phosphorus, arsenic, etc."

Source: United Nations Statistical Office (microfiche).

TABLE 5
FRANCE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1997

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of facilities	Annual capacity
Alumina	Aluminium Péchiney	Plant at Gardanne, Bouches-du-Rhone Province	700
Aluminum	do.	Aluminum smelters at:	
Do.	do.	Saint-Jean-de-Maurienne, Savoie Province	120
Do.	do.	Noguères, Pyrénées, Atlantiques Province	115
Do.	do.	Lannemezan, Hautes-Pyrénées Province	63
Do.	do.	Auzat, Arièege Province	44
Andalusite	Denain-Anzin Minéraux Refractaire Ceramique (DAMREC)	Glomel Mine, Brittany	75
Antimony, metal	Société Nouvelle des Mines de la Lucette	Plant at Le Genest, Mayeene Province	10
Barite	Barytine de Chaillac	Mine and plant at Chaillac, Indre Province	150
Do.	Société Industrielle du Centre	Mine at Rossigno, Indre Province	100
Bauxite	Aluminium Péchiney	Mines in Var Province (closed - maintenance status)	900
Do.	Alumines de Province (S.A.B.A.P.)	do.	200
Cadmium tons	Compagnie Royal Asturienne des Mines	Plant at Auby-les-Douai, Nord Province	200
Cement	Eight companies, of which the largest are:	80 plants, including--	23,233
Do.	La Farge France	15 plants;	7,815
		Largest at St. Pierre-la-Cour	(1,160)
Do.	Société des Ciments Français	13 plants;	6,190
		Largest at Gargenville	(1,100)
Coal	Charbonnages de France (CdF) including:		13,000
Do.	Bassin de Paris	Mines and washeries in middle France	(2,500)
Do.	Bassin de Nord-Pas-de-Calais	Mines and washeries in northern France	(1,000)
Do.	Bassin de Lorraine	Mines and washeries in eastern France	(9,500)
Cobalt, metal tons	Société Métallurgique Le Nickel (SLN)	Plant at Sandouville, near Le Havre	600
Copper, metal	Compagnie General d'Electrolyse du Palais	Electrolytic plant at Palais-sur-Vienne	45
Do.	Société Française d' Affinage du Cuivre.	Smelter at Poissy	11
Do.	Affinerie Sud-Ouest	Refinery at Toulouse	2
Feldspar	Denain-Anzin Minéraux S.A.	Mine and plant at St. Chély d' Apcher	55
Ferroalloys	Société du Ferromanganese de Paris, Outreau	Plant at Boulogne-sur-Mer	420
Do.	Péchiney Electrométallurgie	Plants at Bellegarde	387
Do.	Chromeurope S.A.	Plant at Dunkerque	25
Fluorspar	Société Générale de Recherches et d'Exploitation Minières (SOGEREM)	Mines at Le Burc, Montroc le Moulina, and Trebas	150
Gold kilograms	Société des Mines du Bourneix (Government, 100%)	Mines in the Saint Yrieix la Perche District, Limoges	4,000
Do. do.	Mines d'Or de Salsigne (Eltin Co., 51%, Ranger Co., 18% Peter Hambro Plc., 10%)	Mine near Carcassonne	3,000
Gypsum	S.A. de Materiel de Construction	Mine at Taverny	1,500
Iron and steel:			
Iron ore	Acieries Reunies de Burbach-Eich-Dudelang (ARBED)	Mine at Terres Rouges, Bassin de Lorraine, eastern France	8,000
Steel	Usinor-Sacilor	Dunkerque	7,500
Do.	do.	Fos-sur-Mer	4,200
Do.	do.	Seramange	3,000
Do.	Sollac, Unimetal (Usinor-Sacillor, 100%)	Gadrange, Neuves Maisons, Thonville, Trith-St-Leper	8,400
Kaolin	La Source Compagnie Minière	Kaolin d'Arvor Mine, Quessoy	300
Lead, metal	Métaleurop S.A.	Imperial smelter, Noyelles Godault	110
Magnesium, metal	Société Française d'Electro-Metallurgique	Plant at Marignac, Haute Garonne	14
Natural gas million cubic meters	Société Nationale Elf Aquaitane (SNEA)	Gasfield and plant at Lacq	20,000
Nickel, metal	Société Métallurgia le Nickel (SLN)	Plant at Sandouville	16
Petroleum:			
Crude barrels per day	Société Nationale Elf Aquaitaine (SNEA)	Paris Basin oilfields	1,000
Refined do.	Compagnie Française de Raffinage (Total)	Refineries at Gonfreville and La Mede	446,000
Do.	Shell-Française	Refinery at Petite Couron	285,000

TABLE 5--Continued

FRANCE: STRUCTURE OF THE MINERAL INDUSTRY FOR 1997

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of facilities	Annual capacity
Petroleum--Continued:				
Refined	barrels per day		Refinery at Berre	270,000
Do.	do.	Elf Aquaitaine-France	Refinery at Feyzin	120,000
Do.			Refinery at Donges	200,000
Do.			Refinery at Grandpuits	96,000
Do.		Société Française British Petroleum (S.F.B.P.)	Refineries at Lavera	175,000
Do.		Esso S.A.	Refineries at Fos-sur-Mer	237,000
Do.		Mobil Oil Française	Refineries at Gravenchon	62,000
Do.		Cie. Rhenane de Raffinage (CRR)	Refinery at Reichstett	80,000
Potash, K2O		Mines de Potasse d' Alsace S.A. (MDPA)	Mines at Amélie, Marie-Louise, and Theodore, in Alsace	11,750
Salt, rock		Compagnie des Salins du Midi et des Salines de l'Est	Varangeville Mine at Saint-Nicolas-de-Port	9,000
Sulfur		Société Nationale Elf Aquaitane (SNEA)	Byproduct from natural gas desulfurization, Lacq plant	3,000
Talc		Talc de Luzenac S.A. (Rio Tinto Corp, 100%)	Trimouns Mine near Ariège, Pyrenees	350,000
Uranium, U3O8	tons	Compagnie Général des Matières Nucléaires (COGEMA) (Government, 100%)	Mines at Limousin, Vendee, and Hérault	1,800
Zinc, metal		Société des Mines et Fonderies de Zinc de la Vieille Montagne (VM)	Electrolytic plant, Auby-les-Douai	210

THE MINERAL INDUSTRY OF

GEORGIA

By Richard M. Levine

Georgia has a diverse mineral industry, producing fuels, ferrous and nonferrous metals, ferroalloys, and industrial minerals. Georgia was a major producer of manganese from the Chiatura deposit. The manganese was used in Georgia for ferroalloy production at the Zestafoni ferroalloys plant. A small amount of iron ore also was mined. At the Madneuli complex in Georgia, a copper-barite polymetallic ore deposit was exploited for copper, barite, and a range of byproduct minerals, including gold and silver. Lead and zinc were mined at the Kvaisi lead-zinc deposit, and arsenic was mined from the Lukhumi and the Tsansa deposits. The steel mill in Rustavi had the capacity to produce 1.5 million metric tons per year (Mt/yr) of crude steel, as well as the capacity to produce, coke, pig iron, sinter, and rolled products. Georgia produced a range of industrial minerals, including bentonite, diatomite, talc, and zeolites and also mined semiprecious stones. It also produced some coal, gas, and oil, and has an oil refinery at Batumi.

In 1997, Georgia's gross domestic product (GDP) increased by 11.3% compared with 1996, continuing a trend in GDP growth that started in 1995. Industrial output in 1997 increased by 8.1% compared with 1996. Because Georgia's economic transition problems have been exacerbated by civil war and separatist struggles, Georgia's GDP in 1997 was only 29% of its peak in 1988, and its industrial output, only 18% of its peak in 1989. GDP measurements and other macroeconomic assessments, however, do not necessarily present a complete measure of economic activity because it is estimated that one-third or more of the GDP is produced through unrecorded activities in what is termed the "shadow economy" (Interfax Statistical Report, 1997).

Regarding mineral production, performance was mixed. According to the Ministry of the Economy, reported mineral production was far below Georgia's mineral production capacity (Ministry of Economy, 1998)

Georgia must address its growing foreign debt problem, much of which was for energy and fuel payments to Russia and Turkmenistan. Georgia had not formally rescheduled payments to either country. Russia and Turkmenistan cut off natural gas supplies in 1997 for lack of payment. Gas imports had been used mainly by the Rustavi steel mill and the Tbilisi power station (U.S. Department of Energy, Energy Information Administration, November 1997, Georgia—Economy, accessed March 25, 1998, at URL http://www.eia.doe.gov.emeu/cabs/georgia.html).

During the economic downturn in the years following the breakup of the Soviet Union, the environment became less polluted because the reduction in industrial production caused less energy consumption, resulting in less air pollution and a corresponding reduction in industrial waste. The industrial waste that was generated, however, could not be properly disposed of because funds were lacking and water filtering devices were not maintained. Also, forests were cut down for fuel, which increased soil erosion and created conditions more prone for landslides and avalanches (Georgian Investment Center, 1998, Overview of the economic sectors of Georgia—Environmental protection, accessed July 2, 1998, at URL http://www.georgia.net.ge/gic/Sector/Environment.HTM).

According to the Georgian Investment Center, the "concept of the need for environment protection is being gradually formed in the consciousness of the population." A legislative base concerning environmental protection and natural resources was worked out, and the law on "Environmental Protection" was adopted by the Parliament of Georgia in 1997. The Ministry of Natural Resources and Environmental Protection exercised full control over the environment and natural resources (Georgian Investment Center, 1998, Overview of the economic sectors of Georgia—Environmental protection, accessed July 2, 1998, at URL http://www.georgia.net.ge/gic/Sector/Environment.HTM).

Manganese mined at the Chiaturamarganets (Chiatura manganese) complex, which mines the Chiatura manganese deposit, was one of Georgia's major mineral products. The Chiatura deposit is located in western Georgia and it is connected to the Black Sea coast by a 132-kilometer (km)-long railway and to Tbilisi by a 145-km-long railway. Ore was extracted to a maximum depth of 150 meters. The deposit contains three main types of ore: oxide ore, averaging 26% manganese (Mn); carbonate ore, averaging 17% to 18% Mn; and mixed oxide and carbonate ore, averaging 21% to 22% Mn. In 1996, 76% of the ore was mined underground, and 24% from open pits (Georgian Investment Center, 1998, Overview of the economic sectors of Georgia—Mining, accessed July 2, 1998 at URL http://www.georgia.net.ge/gic/Sector/Mining.HTM). As can be seen in table 2, there has been a great decrease in manganese extraction. The reduction in manganese production volume was the result of the economic crisis and political instability that followed the breakup of the Soviet Union.

In 1996, the Zestafoni ferroalloy plant, located near the Chiatura deposit and a producer of manganese ferroalloys, was signed over to the Russian-Georgian Bank for Reconstruction and Development and North Atlantic Research of the United States for a 10-year trusteeship. In 1997, output at Zestafoni was more than 20,000 metric tons (t), which was an approximately 150% increase compared with that of 1996. Plans called for Zestafoni to produce between 80,000 and 90,000 t of silicomanganese in 1998. Production costs were reduced considerably in 1997, and the trustees reduced debts totaling 21 million lari (1.3 lari = US$1 at yearend 1997) to just 3 million lari. But the Zestafoni plant still suffered from raw material and electricity supply problems. Ore was supplied mainly from the nearby Chiatura manganese deposit, at which production had fallen sharply. Also, the plant was receiving only 40 to 45 megawatts (MW) of a required 70 MW of electricity. The plant consumed about 250 MW in the 1970's and 1980's, when it operated at 90% of capacity and produced about 400,000 metric tons per year (t/yr) of ferroalloys. As early as summer, Zestafoni intended to start making ferrochrome, which should bring annual revenues of $88 million in the short term; these revenues would be equivalent to the plant's combined receipts from the sale of silicomanganese and ferromanganese. Zestafoni intended to finance ferrochrome production through foreign investment. One potential investor was a consortium of Japan's Nissho Iwai and an Israeli division of Bateman of the United States (Interfax Mining and Metals Report, 1998e).

Copper extraction was of great importance for Georgia. Copper is extracted from the Madneuli massive sulfide deposit, which also contains barite, zinc, and precious metals. The ore reportedly averages 1.5% copper with some ore sections grading between 2% and 4%. The central part of the deposit contains gold, and outlying parts contain barite and zinc. Mining was by open pit (Georgian Investment Center, 1998, Overview of the economic sectors of Georgia—Mining, accessed July 2, 1998, at URL http://www.georgia.net.ge/gic/Sector/Mining.HTM).

According to reporting from Georgia based on the reserve classification system that was in effect in the Soviet Union, total reserves of copper are 390,000 t in the B and C1 reserve categories (Georgian Investment Center, 1998, Overview of the economic sectors of Georgia—Mining, accessed July 2, 1998, at URL http://www.georgia.net.ge/gic/Sector/Mining.HTM).

The main reserves of lead and zinc are located in the Kvaisi deposit. The country's lead and zinc reserves reportedly total 5.278 million metric tons (Mt) in categories B and C1. The quantity of lead in the ore is 83,400 t, and the average lead content of the ore is 1.58%; the quantity of zinc contained in the ore is 229,500 t, and the average zinc content of the ore is 4.35%. In the C2 category, there is 4.478 Mt of ore, in which the amount of contained lead is 85,100 t and that of zinc is 168,800 t. An ore-dressing plant operated at the site. Madneuli reportedly had the capacity to extract and process 100,000 t/yr of ore (Georgian Investment Center, 1998, Overview of the economic sectors of Georgia—Mining, accessed July 2, 1998, at URL http://www.georgia.net.ge/gic/Sector/Mining.HTM).

Georgia also produced some gold. In 1991, gold extraction totaled 1.9 t. It was planned to increase the amount to 4 t by 1997. To meet this goal, the Quartzite joint venture was founded in 1993 by the Madneuli mining and ore-dressing enterprise and an Australian company Resources Consortium. Georgia listed the following reserves for certain gold deposits: the Sakdrisi deposit with 15 t in categories C1 and C2, the Madneuli deposit with 23 t in categories C1 and C2, and the Zemo Racha group with 8.8 t in categories B, C1, and C2. Besides gold, Georgia has a number of silver deposits, the largest of which is Madneuli with 200 t of reserves in categories C1 and C2 (Georgian Investment Center, 1998, Overview of the economic sectors of Georgia—Mining, accessed July 2, 1998, at URL http://www.georgia.net.ge/gic/Sector/Mining.HTM).

Regarding other metals, Georgia produced arsenic at the Lukhumi deposit, containing 8,700 t of arsenic in 112,000 t of ore, and at the Tsana deposit, containing 30,000 t of arsenic in 167,000 t of ore (Georgian Investment Center, 1998, Overview of the economic sectors of Georgia—Mining, accessed July 2, 1998, at URL http://www.georgia.net.ge/gic/Sector/Mining.HTM).

Barite is a major ore constituent at the Madneuli deposit, which produced about 30,000 t/yr of barite. High-quality bentonite clays are produced in Georgia at the Gumbra and the Askana deposits. Extraction and processing started in the 1930's in Gumbra with 75% of extraction from underground mining; at Askana, extraction was by open pit. Diatomite is extracted at the Kisatibi deposit in Akhaltsikhe where mining started at the end of the 19th century. Zeolite has been extracted at the Tedzami deposit since 1981. About 25,000 t/yr of talc is mined at the Chorchana talc deposit (Georgian Investment Center, 1998, Overview of the economic sectors of Georgia—Mining, accessed July 2, 1998 at URL http://www.georgia.net.ge/gic/Sector/Mining.HTM).

Also, there are a large number of deposits of decorative stone used as building materials, with mining occurring at more than 100 deposits. There are many clay deposits used in the production of bricks and ceramic products, as well as high-quality quartz sand and sand and gravel deposits. Along with decorative stones, Georgia has deposits of semiprecious stones and produced 20 t/yr of agate and 170 t/yr of obsidian (Georgian Investment Center, 1998, Overview of the economic sectors of Georgia—Mining, accessed July 2, 1998 at URL http://www.georgia.net.ge/gic/Sector/Mining.HTM).

Regarding specific enterprises, Chiaturamarganets had worked at far below capacity for the past 7 years. The Georgian Ministry of State Property was planning to hold an investment tender for 75% of the shares in Chiaturamarganets. Bids were to be invited from Georgian and foreign entities in which the Georgian Government owns at least a 25% share. The winner would have to invest at least $30 million in the complex within 10 years; of that, $3 million should be invested annually in the first 2 years and at least $15 million during the first 5 years. The winner would also have to settle the complex's debts, which totaled $7.5 million. Tender rules also stated that the winner must raise output to at least 50,000 t/yr of manganese concentrate in the first year, 100,000 t/yr from the second through the fourth year, and 150,000 t/yr starting from the fifth year. The future owner would not be able to transfer or mortgage any of the shares or fixed assets without the consent of the Government at any time during the 10 years. Potential investors included British Steel, a consortium of Nissho Iwai of Japan, and the Israeli division of Bateman (Interfax Mining and Metals Report, 1998c).

Enterprises, including the Rustavi metallurgical complex, the largest iron and steel producer in the Caucasus region, were being privatized in the mineral sector. At the beginning of 1996, Rustavi was to be incorporated, with the Government owning 98% of the shares and the employees, 2%. In January 1998, the Georgian Government signed 51% of its Rustavi shares over to a trustee, the limited liability company Metallurgoilgazinvest, for 10 years. This company is a subsidiary of the Metallurginvest joint venture, which is owned by a Russian-Spanish joint venture and an Israeli citizen. The trustee was required to invest up to $90 million in the Rustavi complex during a 10-year period; of that amount, at least $24 million had to be invested in 1998.

Plans called for Rustavi to increase output from 80,000 t/yr to between 300,000 and 400,000 t/yr of crude steel and between 200,000 and 250,000 t/yr of pipes and to restart pig iron production. About one-quarter of Rustavi's fixed assets were out of commission. Original design capacity at Rustavi was 1.5 Mt/yr of crude steel.

The Georgian Ministry of State Property announced a special auction for the sale of the remaining 47% of the Government-owned shares in Rustavi. The first block of 49,316,890 shares would be offered in spring 1998. The shares would be distributed in proportion to the size of the bids from the auction. Bids were invited from private individuals and legal entities in which the Georgian Government owns not more than a 25% share. The Georgian Ministry of State Property later extended the auction to August 1, 1998 (Interfax Mining and Metals Report, 1998a, b). Rustavi was hoping to base its revival, in part, on supplying pipes for oil and gas transport in conjunction with oil and gas development in the Caspian Sea (Interfax Mining and Metals Report, 1998d).

In the copper production sector, the Swiss metals trader Glencore International was adjudged to be the winner of an international tender for the right to manage the Madneuli copper mining and metallurgical complex for a 5-year period. The tender, in which Trapigure, another Swiss firm, also bid, was held in accordance with a decree signed at the end of 1996. Glencore must invest at least $10 million in the Madneuli plant and in the settlement of Kazreti during a 3-year period. It must also increase mining capacity to extract at least 1 Mt/yr of copper ore and 250,000 t/yr of barite ore. In 1996, Madneuli produced 6,000 t of copper concentrate from about 150,000 t of ore. Glencore also received the exclusive right to buy copper and barite concentrates produced at Madneuli during the 5-year management period. Glencore planned to recoup its investment from the sale of these concentrates. Also, Glencore and Georgian representatives were to start negotiating the formation of a joint venture at the Madneuli plant, in which Glencore is expected to own a 51% interest (Interfax Mining and Metals Report, 1997b).

Georgia was not a large producer of precious metals. The Georgian Geology Department estimated that the country's overall proven reserves at lode deposits totaled 260 t of gold and more than 1,500 t of silver. The Geology Department estimated that there are another 250 t of undiscovered gold resources at deposits where exploratory work was still ongoing. Only the Georgian-Australian company Quartzite was mining gold. In 1997, the company commissioned the first stage for producing dore alloy from gold- and silver-bearing quartzites from the Madneuli deposit. The company expected to reach design capacity for producing 2 t/yr of gold in 1998 (Interfax Mining and Metals Report, 1997a).

The lack of electric power was one of the biggest obstacles to economic growth in Georgia. Long power outages were a daily occurrence in much of the country, and parts of Georgia did not receive any electricity. The situation worsened in 1997, because the water level in hydropower reservoirs was low. Hydroelectric power accounted for more than 80% of electric power generation in 1995; this percentage had been increasing yearly because much thermal capacity lay idle owing to the cessation of subsidized fuel deliveries that followed the collapse of the Soviet Union. Also, nonpayment for power continued to hinder the ability of the system to operate. Georgia was actively privatizing its power sector and was seeking foreign equity participation for installing new capacity and rehabilitating projects. Georgia had an estimated 100 billion kilowatts of untapped hydroenergy, as well as untapped coal resources, that could be exploited (U.S. Department of Energy, Energy Information Administration, November 1997, Georgia—Electricity, accessed March 25, 1998, at URL http://www.eia.doe.gov.emeu/cabs/georgia.html).

Georgia had one refinery in Batumi with a capacity to process 5 Mt/yr of crude oil. The Batumi refinery, built in the 1930's, mainly processed crude oil from Russia and Azerbaijan. Most of the equipment at Batumi was worn out and obsolete, and the cost of production was twice that of imported refinery products (Interfax Petroleum Report, 1998b). The refinery at Batumi had been running at less than capacity because of a lack of crude oil supplies. This situation was expected to change with the completion of the pipeline carrying crude oil from Azerbaijan through Georgia to the Black Sea. Georgia was modernizing its refinery at Batumi and awarded a $250 million contract in August to Japan's Marubeni Corporation, which was working with another Japanese firm, the JGC Corporation, and an Austrian firm, Transandia, to expand and modernize the refinery (Interfax Petroleum Report, 1998b).

In June, Georgia awarded Frontera Resources of the United States exclusive rights to explore and develop hydrocarbon resources in the Kakhetin oilfields, which had produced 1.211 Mt of oil since production began in the 1930's. Frontera planned to achieve minimum production levels of 24 metric tons per day within 18 months. Frontera started its work in Georgia in a joint venture with the Georgian oil company Gruzneft to revive production at the Mirzaani, the Patar Shiraki, and the Tarabani fields, which cover an area of more than 5,000 square kilometers south to southwest of Tbilisi. There were 174 wells in these fields, but most had been idle for several years (Interfax Petroleum Report, 1998a).

Georgia possesses limited domestic oil reserves, and its importance for the world energy market is as a potential oil transit center between the energy-rich Caspian Sea countries and Western markets. Nevertheless, Georgia was taking steps to increase domestic oil production and had negotiated several production-sharing agreements and joint ventures in the Kura Basin east of Tbilisi, as well as in the Black Sea region in western Georgia. Georgia has small undeveloped gas resources and must import its natural gas (U.S. Department of Energy, Energy Information Administration, November 1997, Georgia—Oil, accessed March 25, 1998, at URL http://www.eia.doe.gov.emeu/cabs/georgia.html).

In March 1996, Georgia and Azerbaijan signed an agreement to pump a portion of the initial oil flows from the Azerbaijan International Operating Company (AIOC), an international consortium that is developing offshore Caspian Sea oil, along a western route to the Georgian Black Sea port of Supsa. The Georgian International Oil Company, a subsidiary of AIOC, will repair, expand, and modernize the pipeline and port facilities for the initial oil, and plans were to have facilities ready by yearend 1998. Work began in spring 1997 on constructing the Georgian section of the pipeline to transport the initial oil from Azerbaijan and was scheduled to be completed by October 1998 (Summary of World Broadcasts, 1997).

The Chevron Corp. of the United States signed a protocol of intent with Georgia to expand oil shipments from the Tengizchevroil joint venture in Kazakstan across Georgia to Batumi. Shipments were running at about 25,000 barrels per day (bbl/d) via a complicated system of barges, pipeline, and rail. Under the new agreement, the oil would be shipped to Georgia via barge and then through the to-be-rebuilt Kashuri-Batumi oil pipeline to Batumi. If a final agreement were reached, then the joint venture Tengizchevroil would receive the exclusive right to transport oil through this pipeline for the next 25 years. When rebuilt, the 290-km pipeline could carry between 140,000 and 160,000 bbl/d (U.S. Department of Energy, Energy Information Administration, November 1997, Georgia—Oil, accessed March 25, 1998, at URL http://www.eia.doe.gov.emeu/cabs/georgia.html).

Georgia was one of several contenders for routing the main 1-million-barrel-per-day AIOC export pipeline. Two potential routes would cross Georgia with one going though Georgia to the Black Sea and the other through Georgia and Turkey to the Turkish port of Ceyhan on the Mediterranean Sea (U.S. Department of Energy, Energy Information Administration, November 1997, Georgia—Oil, accessed March 25, 1998, at URL http://www.eia.doe.gov.emeu/cabs/georgia.html).

Ukraine was also interested in a project to transport Azerbaijani oil across Georgia to Ukraine. Ukraine had created a pilot project to ship oil via rail across Georgia to Poti and then to the Ukrainian port of Odessa where an oil terminal was under construction. If the pilot succeeded, then about 20,000 bbl/d would be shipped through Georgia to Ukraine (U.S. Department of Energy, Energy Information Administration, November 1997, Georgia—Oil, accessed March 25, 1998, at URL http://www.eia.doe.gov.emeu/cabs/georgia.html).

Georgia's plans to become an oil transit center are conditional upon a number of external political factors involving the struggle between Azerbaijan and Armenia and also on such internal factors as the proposed pipeline routes pass within a few miles of two separatist regions in Georgia, South Ossetia and Abkhazia, where tensions still remain.

It appears that Georgia will attempt to revive and expand production at its existing mineral-production enterprises and will vie to become a major transport corridor for oil from the Caspian Sea.

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TABLE 1
GEORGIA: REPORTED PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997
Cement		30,000	100,000	100,000	84,708	90,600
Coal		100,000	40,000	40,000	6,100	4,200
Manganese, marketable ore		--	--	100,000	70,395	35,112
Natural gas	billion cubic meters	0.020	0.010	0.003	0.003	NA
Petroleum, crude		100,000	70,000	40,000	100,000	100,000
Steel, rolled		100,000	100,000	70,000	60,000	60,000
Zeolites		NA	NA	NA	1,700	6,000

NA Not available

1/ Table lists only those commodities for which reported multi-year production data exist and includes data available through December 10, 1998.

TABLE 2
GEORGIA: REPORTED MANGANESE ORE EXTRACTION AT CHIATURA

(Million metric tons)

1980	1985	1990	1991	1992	1993-94	1995	1996
5.37	2.7	1.2	0.52	0.41	No Output	0.1	0.06-0.07

Source: Georgian Investment Center, 1998, Overview of the economic sectors of Georgia, accessed July 2, 1998, at URL http://www.georgia.net.ge/ /gic/sector/mining.htm.

TABLE 3
GEORGIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Metric tons unless otherwise specified)

Commodity	Major operating entities	Location of main facilities	Annual capacity e/
Arsenic, mine output	Lukhumi deposit Tsana deposit	Upper Racha region Lower Svanetiya region	2,000 total.
Arsenic, metal and compounds	Racha mining and chemical plant	Racha region	NA.
Do.	Tsana mining and chemical plant	Tsana	NA.
Barite	Chordskoye deposit	Onskiy rayon	70,000.
Bentonite	Gumbrskoye and Askanskoye deposits	Gumbra, Askana regions	200,000.
Cement	Rustavi cement plant	Rustavi	1,500,000.
Coal	Tkibuli-Shaorskoye, Tkvarchelskoye, deposits	Tkibuli, Tkvarcheli, Akhaltsikhe regions	300,000 total.
Copper, copper content of ore	Quartzite company	Madneuli region	12,000.
Diatomite	Kisatibskoye deposit	Kisatibi region	150,000.
Ferroalloys	Zestafoni plant	Zestafoni (now Zestap'oni)	100,000 (ferromanganese).
Do.	do.	do.	250,000 (silicomanganese).
Do.	do.	do.	250,000 (manganese sinter).
Gold	Madneuli complex	Madneuli region	2.
Lead-zinc	Kvaisi deposit	Kvaisi region	1,200 (lead).
Do.	do.	do.	3,000(zinc).
Manganese, ore	Chiatura complex	Chiatura region	2,000,000.
Petroleum, crude	About 60 wells accounting for 98% of output	Mirzaani, Teleti, Supsa regions	200,000.
Steel, crude	Rustavi steel mill	Rustavi	1,500,000.

e/ Estimated. NA Not available.

THE MINERAL INDUSTRY OF

GERMANY

By Harold R. Newman

In 1997, the economy of Germany improved. Stronger export demand from outside Western Europe, an improvement in German competitiveness, productivity increases, and a lower exchange rate were contributing factors in the economic growth. The gross domestic product (GDP) showed about a 2.3% growth rate, which was an improvement over the 1.4% GDP of 1996. Germany remained the largest economy in Europe and accounted for more than 25% of the European Union's (EU) economy. Unemployment during the year averaged about 10%. The eastern States of the former German Democratic Republic (GDR) were an integral part of Germany and were being raised to the economic standards of West Germany as quickly as possible. The economic restructuring process was in full swing. The complete reorganization of the economy in the new Federal States has entailed the elimination of many unproductive and unprofitable economic structures left behind by the former centrally planned system. It has understandably been a painful experience for many people. The former GDR was still dependant upon huge net resource transfers from the west via a variety of Federal and State social payments, entitlement and investment grants, and tax waiver incentives for investment and trade (Bureau of Economic and Business Affairs, 1997).

Government Policies and Programs

The German Government's policies were concerned with fighting inflation, lowering unemployment, increasing the country's international competitive status, and safeguarding the environment. The agency responsible for privatizing the GDR holdings, the Treuhandanstalt (Trustee Agency), ceased to exist after privatizing or closing a significant number of operations. The remaining properties were transferred to the Beteiligungs Management Gesellschaft GmbH (Interest Management Association).

Ever since it was founded, Germany (formerly the Federal Republic of Germany) has long been one of the main advocates of European unification, including monetary union. In harmony with the Schengen Agreement, which became effective on March 26, 1995, most of the EU member states, including Germany, have agreed to discontinue border controls. This internal market should provide a boost for European economies, including Germany's export-oriented economy.

Environmental Issues

The environment in Germany is the responsibility of the Federal Ministry for the Environment, Water Conservation and Nuclear Safety. The Ministry's policy is based on the following principles:

•Prevention—New projects are to be developed in such a way as to avoid pollution or damage as much as possible;

•The polluter pays—It is not the public at large, but those causing the damage or pollution who bear the responsibility and cost; and

•Cooperation—The Government, the business community, citizens, and groups in society join forces to solve environmental problems because every individual is responsible for the environment (Bundesregierung Deutschland, 1997, Environmental policy, accessed March 17, 1998, at URL http://www.bundesregierung.de/ausland/economy/econ0702.html).

Environmental concerns that relate to mining and its provisions for environmental impact assessments that must be completed before mining can start are addressed under the Federal mining law. The objective of the assessment is to identify and evaluate of all environmental consequences of a planned project, taking into account various design options. The environmental evaluation process in Germany, as in other countries, presents a risk for the company involved because even after completion of the assessment, which usually involves considerable time and resources, project approval is not guaranteed.

Under provisions of the Federal mining law, the following are required in conjunction with the assessment:

•Description of the expected environmental consequences;

•Data to support identification and estimation of the consequences;

•Description of the preventive measures for avoidance, reduction, equalization, or substitution of the consequences;

•Data concerning the environment and its components;

•Data on alternatives to the planned project; and

•Difficulties associated with gathering the necessary data.

The largest percentage of environmental funds were spent on clean air and water-quality protection. Expenditures on noise reduction, transport of hazardous materials, and the treatment and decontamination of polluted sites were also large.

Production

The minerals and metals industry, which included the industrial processing industry, construction industry, and mining industry, contributed almost 1% to the GDP. Production in the mining and metals industries, as in other industries, depends on a variety of forces, including availability of materials and supply and demand. The easing of the worldwide recession was a positive factor for those industries that depend on exporting their products. *(See* *table 1.)*

The high costs of production in Germany compared with those of competing foreign producers and the problems caused by trying to balance production between the merged eastern and western States helped constrain production. To maintain and increase production and activity, producers and labor unions worked to restructure the traditional work rules that were regarded by some as a restrictive factor in the expansion of the industry. Labor unions agreed to smaller or no real wage increases in 1996, and the trend continued in 1997 (Bureau of Economic and Business Affairs, 1997).

Trade

Foreign trade was a key element in Germany's economic life. After the United States, Germany had the largest foreign trade volume in the world. In 1997, exports amounted to $528.2 billion, and imports totaled $445.7 billion, resulting in a foreign trade surplus for the first time since German reunification on October 6, 1990. One out of every four German jobs depended on exports (Deutschland Magazine, 1998).

France, at 10.8%, was the major supplier of goods to Germany. The United States, at 7.3% was the fourth largest supplier. The United States had a positive trade balance of $5.6 million with Germany (Bureau of Economic and Business Affairs, 1997).

Germany, a major processing nation, relied mainly on imports to feed the metals-processing industry, which transformed raw materials into products that supplied the manufacturing industry, which provided the bulk of the country's exported materials. Table 2 shows a balance of payments of selected commodities. During 1996, the latest year for which data are available, principal export destinations and the principal import sources, based on value, were other EU countries. (*See tables 3 and 4.*)

Structure of the Mineral Industry

The structure of the industry in Germany and the principal companies operating in the production and processing of metals and minerals are shown in table 5. The restructuring and privatization of the facilities in the eastern States continued in 1997. The Interest Management Association retained control of some of the eastern States' companies until they were sold or closed. Most of the producing and processing facilities still in operation in the eastern States were small compared with those in the western States, except for lignite and potash, both of which were very large operations.

Commodity Review

Metals

Aluminum.—In 1997, Germany's primary aluminum industry was the largest in the EU, although it was considered to be medium sized when compared with other world producers. Increased demand and increased price of aluminum resulted in an increase in production. VAW Aluminium AG, a member of the VIAG Group, accounted for more than 75% of the country's primary aluminum production.

VAW's wholly owned aluminum smelters in Germany and its participating interests in smelters abroad ensured the supply of input metal to the company's downstream fabricating operations. With sales of $3.2 billion and a workforce of 12,600, the Group had a strong presence in the European market (VAW Aluminium AG, 1997, Short portrait, accessed December 30, 1997, at URL http://www.vaw.com/Link4B.htm).

Reynolds Metals of the United States was to sell its European rolling mill operations to VAW after agreement on when and the price was decided. The operations being sold included Reynolds Aluminium Deutschland, in Hamburg; Reynolds Italy, in Cisterna; and Industria Navarra del Aluminio, in Irunzun, Spain (Financial Times, 1997).

Lead.—Metallgesellschaft AG, Frankfurt, transferred ownership of its Austrian secondary lead unit, BMG Metall und Recycling GmbH, to its metals holding company, Rheinische Zinkgesellschaft GmbH, Duisburg, as another step in the restructuring of its metals division. All the group's secondary lead plants were then grouped together, which was expected to facilitate greater cooperation among them. The metals group also included electrolytic zinc production and zinc semifabricating operations in Germany.

Metaleurop Weser Blei GmbH's Nordenham ISA lead refinery was operating at its full capacity of 90,000 metric tons per year (t/yr) after modifications to the new bath technology and resolution of some technical problems (Mining Journal, 1997).

Steel.—Two of Germany's largest steel companies, Thyssen Stahl AG and Fried. Krupp AG Hoesch-Krupp, signed a memorandum of understanding for a merger that would create a new joint company, Thyssen-Krupp Stahl. This company was expected to have annual sales of more than $36 billion and an output of more than 15 million metric tons per year (Mt/yr). This agreement would create the world's fifth largest steel company and the third largest in Europe, after British Steel Plc. of the United Kingdom and Usinor Sacilor of France. This could open the way for a major reshaping of the German and European steel industry (BT Commodities, 1997 Thyssen, Krupp to merge steel units, accessed January 13, 1998, at URL http://www.asia.com.sg/btcommo/news26_3.htm).

Preussag Stahl AG was one of Germany's largest steel producers. In addition to flats and beams, Preussag also supplied specially welded large pipes for long-distance petroleum and natural gas pipelines. The new Preussag Stahl AG electric steel works, brought on line in Peine in May 1997, had a capacity of 750,000 t/yr. The electric steel works, built to advanced technological standards, replaced the previous converter steel works, which had provided the rolling mill in Peine with material since 1964. During the course of the converter steel works operation, three converters produced more than 34 million metric tons of crude steel in some 380,000 melts. Production at the former converter steel works was shut down in mid-1996 (Preussag Stahl AG, 1997, accessed January 20, 1998, at URL http://www.preussag.de/engl/archiv/magazin/etstahl.html).

Industrial Minerals

Cement.—The Treuhandanstalt sold the former GDR's cement operations mostly to either German or other Western European companies. A number of these plants were being extensively modernized. Cement demand had increased significantly; so, companies were upgrading their plants for more cost-efficient production.

Clays.—Between 140 and 160 small to medium-sized clay mines were in operation at one time in Germany. About one-half of the high-quality refractory and ceramic clays produced in Germany were from the Rhineland-Palatinate area. Production in Bavaria was concentrated in the Oberfalz area.

Bentonite was almost exclusively mined in Bavaria. Süd-Chemie AG, in Moosburg, was the largest bentonite producer in Western Europe. The second largest company was Erbslöh Geisenheim Industrie GmbH, in Geisenheim. About 30% of the bentonite production was exported for use by the drilling, construction, foundry, and water purification industries.

Germany was the second largest producer of kaolin in Western Europe after the United Kingdom. Still, the country imported about 50% of its requirements of high-quality paper-coating-grade kaolins. Most of the German kaolin was mined in Bavaria, and Amberger Kaolinwerke GmbH was the largest producer and had mines in Hirschau.

Graphite.—Graphitwerk Kropfmühl AG was the only natural graphite mining and processing company in Germany. The company operated a mine and plant at Kropfmühl, Passau, and a plant at Werk Wedel, Holstein. About one-half of the company's production, which has been falling in recent years because of declining reserves, went into the European refractory industry.

Gypsum.—Germany was a major European producer of crude gypsum. The largest producer was Gebr. Knauf Westdeutsche Gipswerke GmbH, which accounted for more than two-thirds of the gypsum produced. The company operated mines in Bavaria, Baden-Württemberg, Hesse, Saarrland, and Lower Saxony. The second largest producer was Rigips Baustoffwerke GmbH, which operated mines in Baden-Württemberg and Lower Saxony.

Magnesia.—After withdrawing from fused alumina and fused spinel production in recent years, Hüls AG was also withdrawing from fused magnesia production. With a production capacity of 15,000 t/yr of fused magnesia at its Niederkassel plant, Hüls was the world's second largest supplier after Universal Ceramic Materials Plc. of the United Kingdom. Because the world electric-grade fused-magnesia supply market was about 45,000 t/yr, the Hüls withdrawal took out a considerable portion of the world's capacity. The major use of fused magnesia is in ceramic insulators for heating elements.

Potash.—Kali und Salz AG operated 17 mines and plants and, after closings and restructuring, had a potassium chloride production capacity of 4 Mt/yr of which 2 Mt/yr was standard grade and 2 Mt/yr was granular grade. Germany was the world's second largest potash producer after Canada.

Mineral Fuels

The most important energy source in Germany's consumption of primary energy was petroleum with a 40% share of total consumption, followed by natural gas with a 20% share; coal, 15% share; lignite, 13% share; nuclear, 10% share; hydroelectricity and wind power, 1% share each; and miscellaneous sources, such as firewood and waste, with a 1% share. About 30% of Germany's primary energy requirement was satisfied from domestic sources; the remaining 70% was imported (Reuther, 1998).

Coal, Anthracite and Bituminous.—Subsidies that have for so long supported Western Europe's coal industry were gradually being phased out, and coal producers will be operating without subsidies by 2000. This was in line with EU policy to eliminate subsidies to industries.

About 77% of hard coal production was from the Ruhr Coalfield where it was mined from seams at depths exceeding 900 meters (m). The coal ranged from anthracite to high-volatile bituminous. The Saar Coalfield was also important, with substantial deposits of bituminous coal. The coal mining industry of Germany was controlled by two companies. The largest was Ruhrkohle AG, a private company, which accounted for more than 85% of total production. The other company, Saarbergwerke AG, accounted for 12% of production and was a state-owned company. One smaller company, Preussag Anthrazit GmbH, accounted for about 3% of production. The brown coal mining industry was controlled almost entirely by Rheinsche Braunkohlenwerke AG, a privately owned company (Coal Age, 1997).

Lignite.—Mining was mainly in the Rheinish area to the west of Cologne and the Lusatian area near Dresden. On a much smaller scale, lignite was mined near Helmstedt. Lignite mining was under less economic pressure than hard coal mining (World Coal, 1997).

The lignite deposit in the Rhine region is the largest single formation in Europe and has considerable domestic importance. Rheinbraun AG was Germany's major lignite producer and mined more than 100 Mt/yr from four open-cast mines—Bergheim, Garzweiler, Hambach, and Inden. The Hambach Mine accounted for one-third of total lignite output in the Rhenish mining area. Electricity generation by the coal-fired power stations of RWE Energie accounted for 85% of Rheinbraun's production (Rheinbraun AG, 1996-97).

Natural Gas.—Ruhrgas AG of Germany signed a 15-year agreement with BP Ltd. of the United Kingdom to supply 15 billion cubic meters of natural gas valued at more than $1 billion beginning in October 1998. The gas will be supplied from BP's North Sea fields and delivered via the Interconnector pipeline being constructed from Bacton in the United Kingdom to Zeebrugge in Belgium. Onward transmission to the German border will be via a new pipeline to be built by Distrigaz of Belgium (Oil Online, 1997, German gas supplies secured into the future, accessed December 30, 1997, at URL http://www.oilonline.com/news/igerman.htm).

Infrastructure

Germany had a total of 625,600 kilometers (km) of highways and roads ranging from the high-speed Autobahn system to undeveloped gravel and packed-dirt country roads. Of the total, the Autobahn consisted of 10,814 km; national highways, 43,786 km; State highways, 99,447 km; and municipal, county, and secondary roads, 471,553 km. The railroad system included 45,468 km of track, about 90% of which was Government owned. Of the total, 44,769 km was 1.435-m standard-gauge track, and 699 km was 1.000-m gauge track. Pipelines included a 3,644-km line for petroleum, 3,964-km line for refined products, and a 97,564-km line for natural gas. Inland waterways and canals consisted of 7,541 km and 31 major ports, with the Kiel Canal serving as an important connection between the Baltic and the North Seas and the Rhein-Main-Danube Canal serving as a connection between the North and the Black Seas. The major maritime ports of Hamburg, Rostock, Bremerhaven, Bremen, and Wihelmshaven accounted for about 70% of total merchandise traffic.

Outlook

Germany's economy was expected to expand steadily for the next few years despite the huge burden of unification costs on the national economy. As growth in Germany's international trading partners increases, industrial production is expected to grow to meet the demands for consumer products. Restructuring industries to be more efficient was expected to result in increased unemployment, which, in turn, would cut into the available resources of the Federal Government in the form of payments for unemployment compensation, retraining, and other social costs. This is expected to continue in the short term.

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(Federal Institute for Geosciences and Natural Resources)
Stilleweg 2, Postfach 51 01 53
30361 Hannover, Germany

Bundesministerium für Forschung und Technologie
(Federal Ministry for Research and Technology)
Heinemannstrasse 2
53175 Bonn, Germany

Bundesministerium für Wirtschaft, Abteiling III, Energiepolitik, Mineralische Rohstoffe (Federal Ministry for Economics, Section III, Energy Policy and Mineral Raw Materials)
Villemombler Strasse 76
53100 Bonn-Duisdorf, Germany

Deutsches Institut für Wirtschaftsforschung (German Institute for Economic Research)
Köningen-Luise Strasse 5
14195 Berlin (Dahlem), Germany

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TABLE 1
GERMANY: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
METALS						
Aluminum:						
Alumina, Al_2O_3 equivalent						
Calcined	thousand tons	840	824	750	755 r/	750
Hydrate	do.	1,110	951	994	792	800
Metal:						
Primary		551,933	504,956	575,160	576,422	571,944 3/
Secondary		408,120	438,082	530,990	416,915	432,467 3/
Arsenic, white, Ar_2O_3 content e/		300	250	250	250	250
Cadmium metal, refinery including secondary e/		1,056	1,145	1,145	1,145	1,140
Cobalt metal including alloys		602	856	800	800	600
Copper, metal refined:						
Smelter:						
Primary		141,300	237,400	242,100	296,800	273,100 3/
Secondary e/		60,000	54,800	66,000	88,600	76,000
Refined:						
Primary		270,400	252,900	247,200	315,600	297,800 3/
Secondary		361,487	339,000	369,100	355,200	375,800 r/
Iron and steel:						
Ore and concentrate:						
Gross weight		145,640	145,760	68,700	100,200 r/	200,900 3/
Fe content		20,400	20,400	960	14,600 r/	28,100 3/
Metal:						
Pig iron	thousand tons	26,969	29,923	30,012	27,722	30,939 3/
Ferroalloys 4/	do.	136	291	280	95 r/	96 3/
Of which ferrochromium	do.	16	17	16	25 r/	26 3/
Steel, crude		37,625	40,836	42,051	39,791	45,009 3/
Semimanufactures	do.	29,840	32,067	34,316	32,889	37,074 3/
Lead:						
Metal:						
Smelter		169,670	166,630	146,040	140,000	140,000
Refined:						
Primary		174,595	189,435	146,750	68,700 r/	131,000 3/
Secondary		159,561	142,249	164,400	149,400 r/	198,300 3/
Nickel, metal, refined		--	--	--	--	
Platinum-group metals, metal, refined e/	kilograms	60,000	65,000	65,000	60,000	60,000
Selenium metal	do.	120	125	120	115	100
Silver, metal, refined e/	do.	600,000	600,000	600,000	600,000	500,000
Tin metal, primary including secondary e/		17,000 r/	16,000 r/	15,000 r/	14,836 3/	15,708 3/
Uranium concentrate, U_3O_8 content		116	47	35	46 r/	27 3/
Zinc, metal including secondary		380,948	359,878	322,460	327,015	317,700 3/
INDUSTRIAL MINERALS						
Abrasives:						
Natural, pumice		647,000	504,000	300,000 r/	210,000 r/	225,000
Artificial, corundum		58,931	56,601	56,000	60,000	60,000
Barite, marketable (contained $BaSO_4$)		131,163	127,383	122,268	121,476	118,698 3/
Boron materials, processed borax, $Na_2B_4O_7\ 10H_2O$ content e/		2,000	1,500	1,500	1,500	1,200
Bromine e/		750	750	750	750	700
Cement:						
Clinker (intended for market)	thousand tons	1,110	1,160	1,200	1,100	1,200
Hydraulic	do.	36,649	40,380	37,480 r/	36,104 r/	37,000
Chalk, crude including ground	do.	440	445	450	450	425
Clays:						
Bentonite	do.	473	499	529	491	511 3/
Bleaching and fuller's earth	do.	670	498	500	500	500
Ceramic clay	do.	3,290	3,540	3,500	3,500	3,500
Fire clay	do.	1,190	1,079	1,000	1,000	1,000
Fuller's earth	do.	670	498	500	600	500
Kaolin, marketable	do.	981	1,631	1,925	1,794 r/	1,800
Other, including brick clay	do.	18,000 r/	20,000 r/	20,000 r/	21,600 r/	22,000 3/

See footnotes at end of table.

TABLE 1--Continued
GERMANY: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
INDUSTRIAL MINERALS--Continued						
Diatomite		7,412	1,030	--	--	--
Feldspar		416,854	379,427	329,624	359,666	455,969 3/
Fluorspar:						
Acid-grade e/		39,000	35,000	38,000	31,000	22,500
Metallurgical-grade e/		997	641	1,081	1,448	1,500
Total		39,997	35,641	39,081	32,448	24,000
Graphite, marketable		4,473	4,369	5,214	2,603	1,500
Gypsum and anhydrite, marketable	thousand tons	2,103	2,264	2,829	3,000	3,000
Lime, quicklime, dead-burned dolomite e/	do.	7,483 3/	8,511 3/	8,000	7,570 r/	7,600
Magnesium salts (byproduct of potash mining)	do.	797	818	1,000 r/	1,169 r/	1,200
Nitrogen, N content of ammonia	do.	2,100	2,170	2,518 r/	2,485 r/	2,471 3/
Phosphate materials:						
Phosphatic fertilizers, P_2O_5 content		730	750	750	750	800
Thomas slag:						
Gross weight	thousand tons	110	134	150	150	150
P_2O_5 content		16,000	19,000	19,000	19,000	19,000
Pigments, mineral, natural		7,710	7,475	5,000 r/	3,754 r/	4,176 3/
Potash:						
Crude, gross weight	thousand tons	30,610	34,621	34,000	32,558 r/	35,878 3/
Crude, K_2O content	do.	2,861	3,277	3,278	4,049 r/	4,197 3/
Marketable, K_2O content	do.	2,861	2,916	2,916	3,332 r/	3,423 3/
Pumice, marketable	do.	647	504	625	600	600
Salt, marketable:						
Evaporated	do.	558	542	617	731	700
Rock and other		12,241	12,557	14,607	15,176	15,087 3/
Sodium compounds, n.e.s.:						
Soda ash, manufactured	thousand tons	1,586	1,380	1,400	1,400	1,400
Sulfate, manufactured	do.	107	113	110	100	100
Stone, sand and gravel:						
Stone:						
Dimension, crude and partly worked	do.	198,000	200,000	200,000	200,000	100,000
Dolomite	do.	788	800	1,000	1,000	4,500
Limestone, industrial	do.	59,900	62,271	60,000	64,000	68,000
Quartz and quartzite		24,200	28,744	29,500	30,000	26,000
Slate		66,900	89,400	90,000	90,000	70,000
Sand and gravel:						
Building sand and gravel	thousand tons	213,000	244,000	250,000	300,000 r/	338,200 3/
Gravel including terrazzo splits	do.	172,000	201,000	200,000	225,000	200,000
Sand:						
Foundry	do.	2,400	3,240	3,000	3,000	4,000
Industrial (glass)	do.	5,841	5,680	7,315	5,503	9,800
Sulfur, byproduct:						
Of metallurgy e/		33,450	35,000	30,000	30,000	25,000
Of natural gas and petroleum e/		1,137,150 3/	1,200,000	1,200,000	1,000,700 3/	1,085,000 3/
Other e/		90,000	90,000	90,000	90,000	50,000
Total		1,260,600	1,325,000	1,003,468	1,000,689	1,160,000
Talc and steatite		10,502	11,538	14,170	10,005 r/	8,819 3/
MINERAL FUELS AND RELATED MATERIALS						
Asphalt and bitumen, natural		8,708	9,017	14,652	9,821	11,285 3/
Carbon black		335,000	299,000	300,000	3,000	3,000
Coal:						
Anthracite and bituminous, marketable	thousand tons	58,283	52,408	53,563	47,913	46,792 3/
Lignite	do.	221,748	207,131	192,753	187,247	177,099 3/
Coke:						
Of anthracite and bituminous coal	do.	12,100	10,919	11,000	10,662 r/	10,744 3/
Of lignite	do.	186	172	175	178 r/	185 3/

See footnotes at end of table.

TABLE 1--Continued
GERMANY: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
MINERAL FUELS AND RELATED MATERIALS--Continued						
Fuel briquets:						
Of anthracite and bitminous coal	do.	585	460	379	357	322 3/
Of lignite (including dust and dried)	do.	9,933	6,849	5,011	4,896	3,539 3/
Gas:						
Manufactured:						
Blast furnace	million cubic meters	4,394	4,730	4,800	4,239 r/	4,655 3/
Coke oven	do.	2,900	2,640	2,600	2,406 r/	2,539 3/
Total	do.	7,294	7,370	7,400	6,645	7,194 3/
Natural:						
Gross	do.	20,330	20,442	21,452	23,058 r/	22,473 3/
Marketed e/	do.	17,500	18,330	19,000	21,360 r/	20,780 3/
Peat:						
Agricultural use	thousand tons	2,739	2,800	2,800	2,800	2,800
Fuel use		180,000	173,000	180,000	180,000	180,000
Petroleum:						
Crude	thousand 42-gallon barrels	22,028	21,198	21,638	20,756	20,361 3/
Refinery products:						
Liquefied petroleum gas	do.	32,800	39,500	35,287	32,352	29,208 3/
Gasoline including aviation	do.	214,000	225,000	246,660	226,058	219,311 3/
Naphtha	do.	76,100	87,300	81,736	79,058	73,925 3/
Mineral jelly and wax	do.	3,930	3,820	3,600	3,600	3,600
Kerosene and jet fuel	do.	20,600	23,000	24,258	25,691	26,000
Distillate fuel oil	do.	344,000	355,000	337,416	353,052	338,744 3/
Refinery gas	do.	3,510 r/	3,680 r/	3,600 r/	3,437 r/	2,821 3/
Lubricants	do.	4,690	4,880	4,800	4,800	4,800
Nonlubricating oils	do.	6,190	6,920	7,000	7,000	7,000
Residual fuel oil	do.	91,800	87,200	78,588	77,769	70,216 3/
Bitumen and other residues	do.	23,100	25,500	25,000	25,000	26,000
Bituminous mixtures	do.	1,100	1,170	1,200	1,200	1,200
Petroleum coke	do.	8,940	9,540	5,247	5,813	5,923 3/
Unspecified	do.	15,900	17,400	18,000	18,000	16,000
Total	do.	846,660	889,910	872,392	862,830	824,748

e/ Estimated. r/ Revised.

1/ Table contains data available through September 30, 1998.

2/ Data are from a combined Germany.

3/ Reported figure.

4/ Includes speigeleisen, unspecified crude iron, and blast furnace ferromanganese with 2% or more carbon.

TABLE 2
GERMANY: BALANCE OF PAYMENTS, SELECTED MINERAL COMMODITIES IN 1996 1/

(Thousand dollars)

Mineral commodity	Exports to EU	Imports from EU	Net gain or (loss)	Exports to the world	Imports from the world	Net gain or (loss)
Crude industrial minerals:						
Chalk	3,154	17,270	(14,116)	4,393	17,480	(13,087)
Graphite, natural	7,080	847	6,233	10,000	20,310	(10,310)
Magnesite	413	2,425	(2,012)	741	9,305	(8,564)
Other	774,054	663,248	110,806	1,028,357	1,273,991	(245,634)
Total	784,701	683,790	100,911	1,043,491	1,321,086	(277,595)
Metalliferous ores:						
Copper	7,629	58,754	(51,125)	7,788	464,035	(456,247)
Iron ore	769	152,617	(151,848)	1,246	1,208,329	(1,207,083)
Lead	--	2,347	(2,347)	--	16,585	(16,585)
Tin	--	1	(1)	12	43	(31)
Zinc	14,358	11,208	3,150	14,444	112,180	(97,736)
Other, including waste and scrap	1,620,160	909,354	710,806	2,053,785	2,760,624	(706,839)
Total	1,642,916	1,134,281	508,635	2,077,275	4,561,796	(2,484,521)
Metals:						
Iron and steel 2/	8,979,069	8,669,666	309,403	15,260,389	11,742,003	3,518,386
Mercury	413	323	90	1,466	489	977
Other nonferrous metals	110,531	86,347	24,184	203,752	357,910	(154,158)
Total	9,090,013	8,756,336	333,677	15,465,607	12,100,402	3,365,205
Mineral fuels	4,345,991	13,961,657	(9,615,666)	6,460,864	35,054,052	(28,593,188)
Nonmetallic mineral manufactures:						
Abrasives, n.e.s., grinding and polishing wheels and stones	159,841	80,229	79,612	279,663	171,139	108,524
Cement	162,022	151,383	10,639	191,089	445,349	(254,260)
Diamond: natural gem, not set or strung	42,325	123,542	(81,217)	106,485	315,631	(209,146)
Dimension stone, worked	35,947	482,420	(446,473)	66,759	604,394	(537,635)
Lime	55,760	42,074	13,686	60,685	52,770	7,915
Mica, worked including agglomerated splittings	1,574	11,625	(10,051)	4,961	20,060	(15,099)
Precious and semiprecious stones other than diamond:						
Natural	24,626	2,719	21,907	172,079	89,845	82,234
Synthetic	3,810	2,832	978	24,000	28,174	(4,174)
Total	485,905	896,824	(410,919)	905,721	1,727,362	(821,641)

1/ Table prepared by Glenn J. Wallace, International Data Unit.

2/ Excludes ferrous waste and scrap.

Source: United Nations Statistical Office (microfiche).

TABLE 3
GERMANY: EXPORTS OF SELECTED MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

		Destinations	
Commodity	Total	United States	Other (principal)
METALS			
Aluminum:			
Ore and concentrate	26,552	–	Netherlands 9,961; France 3,166; Poland 3,085.
Oxides and hydroxides	539,812	55,301	Netherlands 64,890; Italy 63,067; United Kingdom 58,432.
Metal including alloys:			
Scrap	414,209	788	Italy 105,238; Netherlands 71,287; Austria 44,922.
Unwrought	260,033	7,528	Netherlands 52,936; Italy 36,520; Belgium-Luxembourg 31,205.
Semimanufactures	911,731	42,678	United Kingdom 130,296; Italy 117,878; France 95,256.
Antimony, metal including alloys, all forms	86	6	Denmark 38; Belgium-Luxembourg 10; Turkey 10.
Chromium:			
Ore and concentrate	7,130	–	Czech Republic 2,971; Poland 1,403; Sweden 650.
Oxides and hydroxides	15,366	NA	NA.
Metal including alloys, all forms	500	103	France 119, Switzerland 39; United Kingdom 32.
Cobalt:			
Ore and concentrate value, thousands	$4	–	All to Poland.
Oxides and hydroxides	51	2	Austria 8; Netherlands 8; Sweden 5.
Metal including alloys, all forms	1,259	298	United Kingdom 227; France 197; Japan 116.
Copper:			
Ore and concentrate	14,898	–	Sweden 14,844.
Matte and speiss including cement copper	776	–	Netherlands 715; India 28; Poland 18.
Metal including alloys:			
Scrap	248,573	646	Italy 74,265; Belgium-Luxembourg 61,552; Austria 24,010.
Unwrought	269,202	9,967	China 73,317; Italy 43,924; France 26,583.
Semimanufactures	648,784	33,420	Italy 88,333; France 82,827; Austria 62,264.
Gold, metal including alloys, unwrought and partly wrought kilograms	90,447	200	Switzerland 31,702; Italy 14,800; United Kingdom 7,700.
Iron and steel:			
Iron ore and concentrate:			
Excluding roasted pyrite	34,020	–	Belgium-Luxembourg 30,533; United Kingdom 1,250.
Pyrite, roasted	12,886	–	Switzerland 12,733.
Metal:			
Scrap thousand tons	6,684	13	Italy 1,478; Belgium-Luxembourg 1,378; Netherlands 1,119.
Pig iron, cast iron, related materials	123,130	725	France 34,199; Italy 20,980; Belgium-Luxembourg 10,922,
Ferroalloys:			
Ferrochromium	45,426	8,625	France 10,756; Belgium-Luxembourg 5,120; Italy 4,056.
Ferromanganese	12,434	14	Austria 3,129; Belgium-Luxembourg 2,896; Netherlands 1,739.
Ferronickel	1,001	–	Republic of Korea 647; Belgium-Luxembourg 184; North Korea 81.
Ferrosilicochromium	3,719	–	Belgium-Luxembourg 2,139; Austria 525; Slovenia 351.
Ferrosilicomanganese	9,892	–	Netherlands 3,402; Belgium-Luxembourg 2,798; France 1,406.
Ferrosilicon	31,849	340	Belgium-Luxembourg 7,012; France 6,119; Austria 3,787.
Silicon metal	8,796	765	Austria 2,758; Italy 1,274; Belgium-Luxembourg 1,133.
Unspecified	26,845	777	France 5,704; Italy 4,638; Netherlands 2,524.

See footnotes at end of table.

TABLE 3--Continued
GERMANY: EXPORTS OF SELECTED MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
METALS--Continued				
Iron and steel--Continued:				
Metal--Continued:				
Steel, primary forms	thousand tons	2,254	1,138	France 236; Canada 162; Belgium-Luxembourg 150.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	thousand tons	6,116	395	Italy 687; France 633; Netherlands 489.
Clad, plated, coated	do.	3,181	358	France 328; Netherlands 306; United Kingdom 298.
Of alloy steel	do.	1,890	111	Belgium-Luxembourg 254; United Kingdom 202; Italy 176.
Bars, rods, angles, shapes, sections	do.	4,301	335	Netherlands 798; France 518; Belgium-Luxembourg 499.
Rails and accessories		123,917	9,971	Italy 34,279; Iran 19,618; Switzerland 16,970.
Wire		255,400	7,375	France 72,140; Netherlands 30,081; Denmark 16,949.
Tubes, pipes, fittings	thousand tons	2,444	158	Netherlands 327; France 242; United Kingdom 224.
Lead:				
Oxides		21,130	1	Sweden 4,519; Czech Republic 3,549; Netherlands 2,101.
Metal including alloys:				
Scrap		13,598	--	Netherlands 4,637; Belgium-Luxembourg 4,420; France 2,238.
Unwrought		53,785	882	Czech Republic 10,677; Austria 10,110; Netherlands 8,745.
Semimanufactures		16,701	146	Denmark 5,191; France 3,618; Belgium-Luxembourg 1,767.
Manganese:				
Ore and concentrate, metallurgical-grade		428	1	Iran 225; Czech Republic 58.
Oxides		1,762	92	Republic of Korea 535; Slovenia 178; France 170.
Metal including alloys, all forms		6,799	133	Austria 944; Belgium-Luxembourg 749; Australia 679.
Nickel:				
Ore and concentrate		2	--	All to Turkey.
Matte and speiss	value, thousands	$5	--	Slovakia $4; France $1.
Oxides and hydroxides		1	--	All to France.
Metal including alloys:				
Scrap		7,203	1,136	Sweden 3,198; Netherlands 1,036; United Kingdom 464.
Unwrought		11,549	157	France 3,986; Belgium-Luxembourg 2,370; Italy 1,548.
Semimanufactures		13,581	3,142	Slovenia 1,512; United Kingdom 1,330; France 1,209.
Platinum-group metals:				
Waste and sweepings	value, thousands	$35,546	$290	United Kingdom $30,242; Norway $2,341.
Metals including alloys, unwrought and partly wrought	do.	$338,494	$53,118	Japan $52,259; Switzerland $46,220; United Kingdom $44,156.
Silver, metal including alloys, unwrought and partly wrought	do.	$166,757	$4,651	Italy $56,299; Spain $9,652; United Kingdom $9,004.
Tin:				
Ore and concentrate		6	--	All to Brazil.
Metal including alloys:				
Scrap		467	56	Belgium-Luxembourg 248; Netherlands 83; India 41.
Unwrought		731	39	Netherlands 171; Italy 102; Croatia 69.

See footnotes at end of table.

TABLE 3--Continued
GERMANY: EXPORTS OF SELECTED MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
METALS--Continued				
Tin--Continued:				
Metal including alloys--Continued:				
Semimanufactures	value, thousands	$13,768	$410	Hungary $1,362; Finland $1,282; Switzerland $1,131.
Titanium:				
Ore and concentrate		970	2	Italy 427; France 191; Poland 115.
Oxides		46,767	12,988	Republic of Korea 2,904; China 2,727; India 2,436.
Metal including alloys, scrap and unwrought		3,220	1,231	United Kingdom 1,158; Switzerland 451.
Uranium, metal including alloys, all forms	value thousands	$581	$49	United Kingdom $226; France $203; Canada $97.
Zinc:				
Ore and concentrate		46,030	--	Sweden 42,924; Ireland 2,946.
Oxides		27,728	NA	NA.
Blue powder		9,341	7	Italy 1,692; France 1,065; Netherlands 1,091.
Metal including alloys:				
Scrap		29,044	124	Italy 7,752; Belgium-Luxembourg 7,044; Hong Kong 2,914.
Unwrought		97,863	1,171	France 18,339; Italy 14,912; United Kingdom 12,325.
Semimanufactures		35,737	NA	NA.
Zirconium, metal including alloys, scrap and unwrought		83	29	United Kingdom 22; Belgium-Luxembourg 13; Switzerland 5.
Other, waste and scrap of precious metals, n.e.s.	value, thousands	$21,185	$817	Belgium-Luxembourg $10,808; Spain $3,055; Sweden $2,712.
INDUSTRIAL MINERALS				
Abrasives, dust and powder of precious and semiprecious stones including diamond	do.	$87,504	$2,729	Ireland $34,450; Italy $11,955; Austria $8,156.
Barite and witherite		17,468	166	France 5,952; Netherlands 1,347; Austria 1,221.
Cement	thousand tons	2,272	(2/)	Netherlands 1,475; Belgium-Luxembourg 212; France 138.
Chalk		68,144	128	Netherlands 23,684; Denmark 17,649; Belgium-Luxembourg 4,373.
Clays, crude:				
Bentonite		26,021	193	Poland 11,697; Switzerland 2,670; France 2,485.
Kaolin		196,062	3	Austria 48,072; Netherlands 42,423; Italy 25,373.
Unspecified	thousand tons	2,473	(2/)	Italy 1,409; Netherlands 423; France 263.
Diamond, natural:				
Gem, not set or strung	value, thousands	$106,485	$7,909	Belgium-Luxembourg $33,366; Switzerland $13,399; Israel $12,080.
Industrial stones	do.	$5,021	$272	Switzerland $1,679; Netherlands $1,404; Japan $314.
Feldspar		61,176	99	France 23,000; Italy 14,049; Netherlands 6,939.
Fertilizer materials:				
Crude, n.e.s.		31,253	15	France 9,308; Belgium-Luxembourg 4,763; Switzerland 4,343.
Manufactured:				
Ammonia		530,521	24,683	United Kingdom 147,806; France 110,574; Belgium-Luxembourg 86,190.
Nitrogenous	thousand tons	2,498	17	Spain 230; Italy 215; France 212.
Phosphatic		48,450	8	Netherlands 15,768; France 15,050; United Kingdom 4,856.
Potassic	do.	4,707	93	Belgium-Luxembourg 1,019; Brazil 648; United Kingdom 334.

See footnotes at end of table.

TABLE 3--Continued
GERMANY: EXPORTS OF SELECTED MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
INDUSTRIAL MINERALS--Continued				
Fertilizer materials--Continued:				
Manufactured--Continued:				
Unspecified and mixed		654,249	353	France 48,817; United Kingdom 13,308; unspecified 539,145.
Fluorspar		238,905	--	South Africa 98,099; China 80,386; Kenya 31,398.
Graphite, natural		9,493	61	Netherlands 1,589; France 1,411; Austria 1,194.
Gypsum and plaster	thousand tons	1,111	(2/)	Belgium-Luxembourg 299; United Kingdom 189; France 129.
Lime		644,755	27	Netherlands 407,348; France 99,570; Belgium-Luxembourg 42,823.
Magnesium compounds, oxides and hydroxides		69,346	9	France 35,950; Austria 20,196; United Kingdom 2,153.
Phosphates, crude		217	2	Austria 100; Nigeria 82; Macedonia 16.
Pigments, mineral, iron oxides and hydroxides, processed		123,733	NA	NA.
Precious and semiprecious stones other than diamond:				
Natural	value, thousands	$172,079	$34,447	Switzerland $34,311; Hong Kong $29,728; Japan $24,967.
Synthetic	do.	$4,696	$80	Philippines $1,650; Spain $796; France $614.
Salt and brine	do.	2,852	1	Belgium-Luxembourg 1,167; Czech Republic 367; Sweden 361.
Sodium compounds, n.e.s., soda ash		605,495	29	France 60,975; Netherlands 55,114; Denmark 36,858.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked		162,335	221	Switzerland 103,021; Netherlands 26,744; Italy 5,948.
Worked		80,103	1,585	Belgium-Luxembourg 18,194; Netherlands 13,136; Switzerland 9,719.
Dolomite, chiefly refractory-grade		281,967	96	Belgium-Luxembourg 136,356; Netherlands 74,846; France 36,563.
Gravel and crushed rock	thousand tons	12,958	1	Netherlands 9,557; Switzerland 1,009; France 583.
Limestone other than dimension		78,596	--	Netherlands 39,524; Belgium-Luxembourg 28,448; Switzerland 7,897.
Quartz and quartzite		65,998	365	Netherlands 13,248; Belgium-Luxembourg 10,486; Switzerland 4,637.
Sand other than metal-bearing	thousand tons	7,714	1	Portugal 5,649; Belgium-Luxembourg 1,273; Switzerland 397.
Sulfur, elemental, crude including native and byproduct		969,429	87,456	Belgium-Luxembourg 183,191; Brazil 111,000; United Kingdom 110,096.
Talc, steatite, soapstone, pyrophyllite		6,099	7	Slovenia 936; Denmark 718; Hungary 695.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black		116,915	3,116	France 31,580; Belgium-Luxembourg 17,412; Austria 12,243.
Coal:				
Anthracite		539,499	--	Belgium-Luxembourg 205,558; France 149,856; United Kingdom 123,831.
Bituminous		377,438	--	Belgium-Luxembourg 357,465; Switzerland 16,213; Austria 2,975.
Briquets of anthracite and bituminous coal		132,804	--	France 78,905; United Kingdom 43,065.
Lignite including briquets		544,460	--	Belgium-Luxembourg 212,541; France 73,121; Netherlands 35,016.
Coke and semicoke		194,180	21	Netherlands 47,891; France 25,242; Norway 24,979.
Peat including briquets and litter	thousand tons	1,836	71	Netherlands 938; France 215; Italy 177.

See footnotes at end of table.

TABLE 3--Continued
GERMANY: EXPORTS OF SELECTED MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS--Continued:				
Petroleum:				
Crude	do.	1,090	--	Netherlands 456; United Kingdom 199; Sweden 157.
Refinery products:				
Liquefied petroleum gas		495,239	--	Austria 61,665; Poland 49,306; United Kingdom 45,223.
Gasoline, motor	thousand tons	3,593	80	Switzerland 1,188; Netherlands 628; France 399.
Mineral jelly and wax		217,636	14	Netherlands 23,699; France 14,741; Belgium-Luxembourg 13,897.
Kerosene and jet fuel	thousand tons	1,930	(2/)	Sweden 175; Switzerland 34; bunkers 1,608.
Distillate fuel oil	do.	3,491	60	France 882; Austria 739; Switzerland 521.
Lubricants		483,535	1,492	Austria 77,313; Belgium-Luxembourg 63,371; Netherlands 37,348.
Residual fuel oil		4,155	598	Sweden 1,191; United Kingdom 540; Netherlands 417.
Bitumen and other residues		504,444	--	Netherlands 118,701; Austria 91,431; Switzerland 78,759.
Bituminous mixtures		38,002	325	Switzerland 9,188; Austria 4,697; Czech Republic 4,649.
Petroleum coke		509,304	30	Netherlands 150,027; France 119,008; Slovakia 53,211.

NA Not available.

1/ Table prepared by Virginia Woodson.

2/ Less than 1/2 unit.

Source: United Nations Statistical Office (microfiche).

TABLE 4
GERMANY: IMPORTS OF SELECTED MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	thousand tons	1,355	(2/)	Guyana 555; Guinea 344; China 133.
Oxides and hydroxides		929,267	10,950	Jamaica 340,098; Spain 150,760; Hungary 107,126.
Metal including alloys:				
Scrap		259,669	260	Netherlands 61,061; Italy 26,100; Switzerland 20,233.
Unwrought	thousand tons	1,109	1	Norway 246; Netherlands 149; Canada 103.
Semimanufactures		640,103	8	France 93,964; Austria 57,283; Italy 57,024.
Antimony, metal including alloys, all forms		592	12	China 327; Russia 130; Kyrgyzstan 48.
Chromium:				
Ore and concentrate		177,938	29	South Africa 128,969; Turkey 44,663.
Oxides and hydroxides		7,723	1,360	Kazakstan 1,816; Poland 1,552; Italy 1,547.
Metal including alloys, all forms		1,480	67	Russia 372; Belgium-Luxembourg 317; France 285.
Cobalt:				
Ore and concentrate		177,938	29	South Africa 128,969; Turkey 44,663.
Oxides and hydroxides		346	(3/)	Finland 139; Belgium-Luxembourg 71; Netherlands 47.
Metal including alloys, all forms		2,507	17	South Africa 559; Russia 392; Congo (Brazzaville) 202.
Copper:				
Ore and concentrate		689,055	10	Chile 210,629; Portugal 155,263; Indonesia 131,521.
Matte and speiss including cement copper		12,202	92	Australia 10,007; United Kingdom 664; Morocco 552.
Metal including alloys:				
Scrap		427,249	1,698	Russia 130,894; Netherlands 48,270; France 28,441.
Unwrought		574,194	1,797	Russia 246,985; Chile 98,329; Poland 44,354.
Semimanufactures		373,954	2,444	France 100,612; Belgium-Luxembourg 77,150; Italy 37,040.
Gold:				
Waste and sweepings	value, thousands	$160,727	$2,089	Sweden $22,815; Eritrea $18,812; Norway $14,640.
Metal including alloys, unwrought and partly wrought	kilograms	94,890	2,000	United Kingdom 31,700; Canada 14,800; Switzerland 12,100.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	thousand tons	39,303	(2/)	Canada 5,515; Brazil 5,351; Sweden 5,162.
Pyrite, roasted		71,484	–	Norway 67,500; Netherlands 3,984.
Metal:				
Scrap	thousand tons	1,335	4	Czech Republic 270; Denmark 213; Netherlands 167.
Pig iron, cast iron, related materials		330,788	1,161	Czech Republic 58,078; Canada 45,774; Brazil 40,468.
Ferroalloys:				
Ferrochromium		339,641	412	South Africa 156,461; Norway 44,449; Zimbabwe 35,291.
Ferromanganese		152,090	193	France 54,975; South Africa 22,963; Norway 17,873.
Ferronickel		77,681	4	Domican Republic 19,163; Greece 18,151; Brazil 9,042.
Ferrosilicochromium		18,711	–	Zimbabwe 5,219; Russia 4,366; Ukraine 1,013.
Ferrosilicomanganese		121,775	–	China 32,300; Norway 24,545; Romania 21,208.
Ferrosilicon		179,526	231	Norway 92,142; Slovakia 17,024; Poland 11,758.
Silicon metal		95,901	87	Norway 42,999; France 15,385; Canada 11,702.

See footnotes at end of table.

TABLE 4--Continued
GERMANY: IMPORTS OF SELECTED MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

			Destinations	
Commodity		Total	United States	Other (principal)
METALS--Continued				
Iron and steel--Continued:				
Ferroalloys--Continued:				
Unspecified		55,218	1,887	France 12,849; Russia 6,493; Brazil 5,657.
Steel, primary forms		998,893	196	Belgium-Luxembourg 379,996; United Kingdom 116,600; Netherlands 101,174.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	thousand tons	4,656	1	Belgium-Luxembourg 1,026; Netherlands 554; Austria 384.
Clad, plated, coated	do.	2,093	37	Belgium-Luxembourg 558; France 524; Austria 450.
Of alloy steel		671,217	2,502	France 157,631; Sweden 115,944; Belgium-Luxembourg 93,428.
Bars, rods, angles, shapes, sections	thousand tons	4,790	12	France 870; Italy 816; Czech Republic 537.
Rails and accessories		90,180	35	Poland 64,789; Czech Republic 7,194; United Kingdom 5,274.
Wire		504,198	789	France 108,350; Czech Republic 95,672; Belgium-Luxembourg 76,160.
Tubes, pipes, fittings	thousand tons	1,624	6	Italy 406; Czech Republic 153; France 145.
Lead:				
Ore and concentrate		48,673	5,618	Canada 17,707; Poland 9,961; Sweden 4,686.
Oxides		15,329	10	France 4,779; unspecified 9,101.
Metal including alloys:				
Scrap		8,707	--	Switzerland 1,643; Austria 1,428; Hungary 983.
Unwrought		126,582	4,570	Belgium-Luxembourg 26,655; United Kingdom 24,481; France 23,135.
Semimanufactures		8,949	12	United Kingdom 3,556; Belgium-Luxembourg 3,243; France 308.
Manganese:				
Ore and concentrate, metallurgical grade		12,717	--	South Africa 2,648; Morocco 2,613; Australia 2,242.
Oxides		6,567	332	Ireland 1,800; Belgium-Luxembourg 1,427; Japan 826.
Metal including alloys, all forms		18,665	66	China 7,770; Ukraine 4,379; South Africa 3,318.
Nickel:				
Ore and concentrate		2	--	Brazil 1, Norway 1.
Matte and speiss		40	--	All from United Kingdom.
Oxides and hydroxides		9,277	--	Russia 6,715; Canada 2,562.
Metal including alloys:				
Scrap		10,474	712	Russia 3,080; France 2,053; Lithuania 1,069.
Unwrought		61,423	110	Russia 27,239; Australia 7,500; Norway 6,687.
Semimanufactures		9,275	1,356	France 2,810; Slovenia 1,182; Austria 940.
Platinum-group metals:				
Waste and sweepings	value, thousands	$176,296	$37,973	Switzerland $14,067; Croatia $11,701; Czech Republic $10,408.
Metals including alloys, unwrought and partly wrought	do.	$435,472	$53,129	South Africa $142,774; Switzerland $71,661; Russia $48,649.
Silver, metal including alloys, unwrought and partly wrought	do.	$181,391	$9,273	United Kingdom $37,373; Poland $33,439; France $31,390.
Tin:				
Ore and concentrate		177	--	Rwanda 173; United Kingdom 4.
Metal including alloys:				
Scrap		248	6	Austria 49; Czech Republic 37; Netherlands 35.
Unwrought		20,387	678	China 9,648; Russia 2,832; Indonesia 2,503.
Semimanufactures		623	8	Netherlands 421; France 79; Belgium-Luxembourg 51.

See footnotes at end of table.

TABLE 4--Continued
GERMANY: IMPORTS OF SELECTED MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
METALS--Continued				
Titanium, metal:				
Oxides		21,983	789	Slovenia 7,034; Belgium-Luxembourg 5,689; France 3,133.
Ore and concentrate		593,300	7,794	Canada 220,965; Norway 196,557; South Africa 79,870.
Metal including alloys:				
Scrap and unwrought		6,369	23	Switzerland 218; United Kingdom 178; unspecified 5,002.
Semimanufactures		1,606	549	France 289; Russia 175; Italy 172.
Uranium, metal including alloys, all forms	value, thousands	$44,135	--	United Kingdom $14,386; Russia $6,325; Canada $6,012.
Zinc:				
Ore and concentrate		439,315	55,506	Canada 192,890; Peru 51,646; Australia 42,495.
Oxides		18,539	34	Netherlands 7,326; United Kingdom 1,910; Poland 1,740.
Blue powder		7,946	1	Belgium-Luxembourg 5,630; Norway 1,467.
Metal including alloys:				
Scrap		10,021	--	France 5,330; Netherlands 887; Belgium-Luxembourg 408.
Unwrought		240,746	1	Belgium-Luxembourg 88,064; Netherlands 34,001; Norway 33,837.
Semimanufactures		63,196	7,218	France 20,694; Netherlands 9,044; Slovenia 8,237.
Other:				
Ores and concentrates of precious metals, n.e.s.	value, thousands	$115,445	--	South Africa $104,305; Sweden $5,878; Finland $5,247.
Waste of precious metals, n.e.s.	do.	$403,086	$85,015	Chile $131,144; Philippines $55,442; Singapore $11,682.
INDUSTRIAL MINERALS				
Abrasives, n.e.s., dust and powder of precious and semiprecious stones including diamond	do.	$69,703	$18,846	Ireland $40,936; Italy $3,055.
Barite and witherite		203,474	(2/)	China 63,632; France 54,294; Bulgaria 37,197.
Cement	thousand tons	7,444	(2/)	Poland 3,284; Czech Republic 1,205; Belgium-Luxembourg 804.
Chalk		200,104	19	France 96,130; Belgium-Luxembourg 53,309; Denmark 20,181.
Clays, crude:				
Bentonite		164,547	18,019	Greece 46,439; Italy 18,497; Netherlands 13,132.
Kaolin		633,465	138,775	United Kingdom 216,587; Czech Republic 111,866; Brazil 53,208.
Unspecified		331,467	63,333	Czech Republic 89,572; France 44,920; United Kingdom 31,500.
Diamond, natural:				
Gem, not set or strung	value thousands	$315,631	$9,200	Belgium-Luxembourg $121,104; Israel $75,345; Russia $29,132.
Industrial stones	do.	$8,043	$449	Belgium-Luxembourg $1,971; Switzerland $1,165; South Africia $847.
Feldspar		130,512	35	Norway 85,951; Italy 15,269; Finland 10,442.
Fertilizer materials:				
Crude, n.e.s.		14,390	270	Netherlands 6,549; Belgium-Luxembourg 3,971; Austria 1,299.
Manufactured:				
Ammonia		212,974	(3/)	Russia 90,118; Netherlands 38,649; Czech Republic 22,203.
Nitrogenous	thousand tons	4,258	2	Netherlands 1,430; Belgium-Luxembourg 663; Czech Republic 420.
Phosphatic		223,218	--	Belgium-Luxembourg 125,614; Netherlands 55,886; Russia 31,296.

See footnotes at end of table.

TABLE 4--Continued
GERMANY: IMPORTS OF SELECTED MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
INDUSTRIAL MINERALS--Continued:				
Fertilizer materials--Continued:				
Manufactured--Continued:				
Potassic		110,644	192	Israel 74,890; France 23,381; Netherlands 8,335.
Unspecified and mixed	thousand tons	1,394	12	Netherlands 301; Russia 223; Belgium-Luxembourg 166.
Fluorspar		238,905	--	South Africa 98,099; China 80,386; Kenya 31,398.
Graphite, natural		41,346	474	China 15,408; Madagascar 4,540; Ukraine 3,609.
Gypsum and plaster		276,408	1,317	France 158,557; Austria 48,490; Netherlands 23,276.
Lime		700,752	--	France 278,886; Belgium-Luxembourg 190,744; Czech Republic 52,933.
Magnesium compounds:				
Magnesite, crude		26,015	1,092	Spain 3,664; Greece 3,062; Netherlands 933.
Oxides and hydroxides		523,865	23,685	China 147,926; Netherlands 68,901; Austria 49,521.
Phosphates, crude		257,536	7,385	Israel 133,550; Russia 71,955; Algeria 19,579.
Precious and semiprecious stones other than diamond, natural	value, thousands	$89,845	$5,352	Thailand $23,384; Brazil $15,557; India $7,619.
Pyrite, unroasted		163,293	--	Finland 160,532; Italy 2,129.
Quartz crystal, piezoelectric	value, thousands	$14,163	$5,666	Japan $6,425; Russia $647; United Kingdom $634.
Salt and brine	do.	1,674	(2/)	Netherlands 1,520.
Sodium compounds, n.e.s., sulfate, natural and manufactured		70,658	1	Belgium-Luxembourg 29,464; Austria 18,060; Spain 12,438.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked		505,757	2,025	Norway 128,379; India 70,704; France 64,609.
Worked	thousand tons	1,530	1	Italy 396; Poland 219; Portugal 213.
Dolomite, chiefly refractory-grade		567,185	7	Latvia 289,283; Belgium-Luxembourg 94,397; Denmark 83,561.
Gravel and crushed rock	thousand tons	18,858	325	Norway 4,861; Poland 4,212; France 3,719.
Limestone other than dimension	do.	1,913	(2/)	Poland 1,047; Austria 473; France 179.
Quartz and quartzite		40,839	223	Netherlands 20,332; Belgium-Luxembourg 6,337; Austria 5,113.
Sand other than metal-bearing	thousand tons	3,608	5	France 1,840; Netherlands 1,107; Poland 342.
Talc, steatite, soapstone, pyrophyllite		226,137	4,343	Finland 62,911; Austria 58,944; France 31,455.
Vermiculite, perlite, etc.		114,959	1,643	Greece 82,373; South Africa 12,914; Hungary 9,270.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black		101,944	5,795	France 34,954; Netherlands 18,046; Hungary 10,679.
Coal:				
Anthracite		258,966	793	Netherlands 47,562; Belgium-Luxembourg 45,265; Russia 43,816.
Bituminous	thousand tons	14,846	1,905	South Africa 5,635; Poland 3,074; Colombia 2,011.
Briquets of anthracite and bituminous coal		111,390	159	France 44,204; Colombia 29,389; Netherlands 18,512.
Lignite including briquets	thousand tons	2,559	--	Czech Republic 2,332; Poland 127.
Coke and semicoke	do.	3,263	263	Poland 1,027; Czech Republic 471; China 303.
Gas, natural, gaseous	do.	66,932	NA	NA.
Peat including briquets and litter		314,149	--	Estonia 107,355; Latvia 57,180; Netherlands 56,674.
Petroleum:				
Crude	thousand tons	103,542	8	Russia 25,541; Norway 22,137; United Kingdom 18,086.
Refinery products:				
Liquefied petroleum gas	do.	915,102	284	Netherlands 268,630; Norway 225,132; Belgium-Luxembourg 189,567.

See footnotes at end of table.

TABLE 4--Continued
GERMANY: IMPORTS OF SELECTED MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS--Continued:				
Petroleum--Continued:				
Refinery products--Continued:				
Gasoline, motor	do.	11,650	25	Netherlands 6,810; France 1,281; Belgium-Luxembourg 1,196.
Mineral jelly and wax		343,994	44,803	Netherlands 51,216; France 48,052; Malaysia 18,425.
Kerosene and jet fuel	thousand tons	2,778	18	Netherlands 2,228; Belgium-Luxembourg 276; France 120.
Distillate fuel oil	do.	19,913	88	Netherlands 10,048; Sweden 2,046; Russia 1,841.
Lubricants		438,828	7,576	France 128,912; Netherlands 98,989; Belgium-Luxembourg 47,091.
Residual fuel oil	thousand tons	3,559	(2/)	Netherlands 1,018; Belgium-Luxembourg 968; Russia 391.
Bitumen and other residues		590,680	645	Belgium-Luxembourg 251,229; Czech Republic 162,582; France 87,550.
Bituminous mixtures		15,882	222	Switzerland 5,406; Netherlands 4,390; Belgium-Luxembourg 2,563.
Petroleum coke	thousand tons	1,135	896	United Kingdom 94; Argentina 29.

1/ Table prepared by Virginia Woodson.

2/ Less than 1/2 unit.

3/ Unreported unit valued at less than $10,000.

Source: United Nations Statistical Office (microfiche).

TABLE 5
GERMANY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1997

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Alumina	VAW Aluminium AG	Plant at Schwandorf (special aluminas)	430
Do.	Aluminium Oxid Stade GmbH (VAW, 50%)	Plant at Stade	750
Do.	Martinswerke GmbH (Alusuisse, 100%)	Plant at Bergheim (fused alumina)	350
Aluminum	VAW Aluminium AG	Smelters at Innwerke at Töging, Elbewerke at Stade, Rheinwerke at Neuss, Lippenwerke at Lünen (secondary)	300
Do.	Aluminium Essen GmbH	Smelter at Essen-Borbeck	95
Do.	Hamburger Aluminium-Werke GmbH (VAW, 33%)	Smelter at Hamburg	120
Bentonite	Süd-Chemie AG	Mines at Gammelsdorf, upper Bavaria	450
Do.	Do.	Plants at Mooseburg and Kelheim, upper Bavaria	350
Cement	38 companies, the major ones are:	64 mills (grinding) including:	59,000
Do.	Heidelberger Zement AG	Plants at Blaubeuren-Schelklingen, Leimen, Hassmersheim, Burglengenfeld, Kieferssfelden, and others	(9,200)
Do.	Dyckerhoff AG	Plants at Amoneburg, Golheim, Neuwied, Neubeckum, and others	(7,250)
Do.	E. Schwenk, Zementwerke KG	Plants at Allmendingen, Karlstadt, and Mergelstetten	(6,000)
Do.	Anneliese Zementwerke AG	Plants at Ennigerloh-Nord, Ennigerloh-Sud, Geske, and Paderborn	(3,500)
Do.	Zementwerke Deunan GmbH	Plant at Deuna	(3,000)
Chalk	Kreidewerke Rugen GmbH	Quarries on Rugen Island	500
Coal, anthracite and bituminous	Four companies:	About 27 mines, including:	72,500,
Do.	Ruhrkohle AG	14 mines in Ruhr region	(40,000)
Do.	Saarbergwerke AG	5 mines in Saar basin	(14,000)
Do.	Preussag Anthrazit GmbH	Mine at Ibbenbüren	(2,500)
Copper	Norddeutsche Affinerie AG (Inmet Mining, 35%; M.I.M. Holdings, 35%; Degussa AG, 30%)	Smelter and refinery, both at Hamburg	290 350
Do.	Hüttenwerke Kayser AG	Refinery at Lünen	120
Graphite	Graphitwerk Kropfmühl AG	Mine at Kropfmühl	8
Do.	Do.	Plant at Kropfmühl	20
Gypsum	Gebr. Knauf Westdeutsche Gipswerke GmbH	Mines at Iphofen, Neuherberg and Velhey	650
Do.	Do.	Plants at Iphofen, Lauffin, Neumorcher,and Statoldendorf	1,000
Kaolin	Kemmlitzer Kaolinwerke GmbH	Mines at Gröppendorf, Oschatz, and Sachsen	100
Do.	Do.	Plant at Sachen	100
Limestone	Harz Kalk GmbH	Quarries at Bad Kösen, Rubelaand, and Kaltes Tal	6,000
Lead	Metaleurop Weser Blei GmbH	ISA refinery at Nordenham Primary and secondary smelter at Nordenham	90 120
Do.	Berzelius Metallhütten GmbH	QSL smelter at Stolberg	75
Do.	do.	Refinery at Duisberg	120
Do.	Norddeutsche Affinerie AG	Refinery at Hamburg	50
Lignite	Rheinische Braunkohlenwerke AG (Rheinbraun)	Surface mines in Rhenish mining area: Garzweiler, Bergheim, Inden, and Hambach	105,000

TABLE 5--Continued
GERMANY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1997

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Lignite		Lausitzer Braunkohle AG (LAUBAG)	Surface mines in Lausatian mining area: Jänschwalde/ Cottbus-Nord, Welzow-Süd, and Nochten/Reichswalde	50,000
Natural gas	million cubic meters	Brigitta Erdgas und Erdöl GmbH and Elwerath Erdgas-Erdöl GmbH	Plants at Clenze and Grossenkmeten	9,500
Do.	do.	Mobil Erdgas-Erdöl GmbH	Plants at Scholen	4,000
Do.	do.	Other companies	Plants at Duste, Rutenbrock, and others	2,000
Petroleum:				
Crude	thousand 42-gallon barrels	The largest companies were:	6 areas with about 85 oilfields, including:	80,000
Do.	do.	Elwerath Erdgas-Erdöl GmbH	West of Ems River	(30,000)
Do.	do.	Wintershall AG	Weser-Ems Rivers	(21,000)
Do.	do.	Deutsche Texaco AG	Elbe-Weser Rivers	(20,000)
Refined	do.	About 25 companies, of which the largest were:	20 refineries, including:	2,062,000
Do.	do.	Deutsche Shell AG	Refineries at Godorf, Hamburg, and Grasbrook	(256,000)
Do.	do.	Esso AG	Refineries at Karlsruhe and Ingolstadt	(245,000)
Do.	do.	Ruhr Oel AG	Refinery at Gelsenkirchen	(215,500)
Do.	do.	Erdoel Raffinerie Neustadt GmbH	Refinery at Neustadt-Donau	(145,000)
Potash		Kali und Salz AG	Mines at Bergmannssegen-Hugo, Niedersachen-Riedel, Salzdetfurth, Sigmundshall, Hattorf, Neuhof-Ellers, and Wintershall	4,000 K_2O
Do.		MDK (Mitteldeutsche Kali und Sondershausen)	10 mines mostly in the State of Thüringen	2,500 K_2O
Salt (rock)		Kali und Salz AG	Mines at Bad Friedrichshall-Kochendorf, Braunschweig-Luneburg, Heilbronn, Riedel, Stetten, and Wesel (Borth)	15,000
Steel		Major companies including:	About 25 plants, including:	45,000
Do.		Thyssen Stahl AG	Plants at Krefeld, Duisburg, Hattungen, Oberhausen and Written	(13,000)
Do.		Fried. Krupp AG Hoesch-Krupp	Plants at Bochum, Dortmund, and Rheinhausen	(9,000)
Do.		Stahlwerke Peine-Salzgitter AG	Plants at Peine and Salzgitter	(4,500)
Do.		Klöckner-Werke AG	Plants at Bremen and Osnabruck	(4,200)
Do.		Preussag Stahl AG	Plant at Peine	(750)
Zinc		Ruhr-Zink GmbH	Refinery at Datteln	200
Do.		Berzelius Metallhütten GmbH	Imperial smelter and fire refinery at Duisburg	100
Do.		Metaleurop Weser Zink GmbH	Refinery at Nordenham	130

THE MINERAL INDUSTRY OF

GREECE

By Harold R. Newman

The mining and metal processing sectors of the economy of Greece were a small but important part's of the national economy and were highly concentrated. About 60% of the sectors' turnover was handled by five mining companies. Bauxite was the most important of Greek metal deposits, but there were also deposits of chromite, gold, iron, lead, nickel, and zinc. Aluminum was produced from domestic sources of bauxite and alumina and was important in the domestically integrated metal's sector. The steel produced was mostly from imported scrap. Greece was the largest producer of bauxite and nickel in the European Union (EU).

The industrial mineral sector was more important in the national economy than the metal sector in 1997. The more important commodities were bentonite, magnesite, and perlite. Important exports were bentonite, magnesite, perlite, and pumice. Privatization efforts were continuing in the magnesite and refractories industries. Greece is the largest producer of magnesium and perlite in the EU. *(See table 1.)*

Production of mineral commodities in Greece was closely tied to the export market. Exports of such minerals as bauxite, bentonite, nickel, and perlite made up a major share of total revenues. Although about 50% of the country's minerals were exported, over the long-term the sector's significance was slowly lessening. The mining sector's share of the gross national product was 1.7%. General trade information for Greece indicated that the other members of the EU continued to strengthen their positions as the principal destinations and sources of Greek mineral exports and imports. There was a mineral resource surplus trade balance as more minerals were exported than imported (Mining and Metals, February 1997, Tapping into Greece's mineral treasure chest, accessed April 9, 1998 at URL http://www.ana.gr/hermes/ 1998/feb/mining.htm). Selected Greek companies with major equity owners are shown in table 2.

Environmental concerns were the responsibility of the Ministry of Environment, Town Planning and Public Works. The Government took an active role in environmental programs for the protection of the environment. The general laws enacted by the Government included law 1360/76 "Siting Arrangement and Environment," the Presidential Executive Order 1180/81, and law 1650/86 "Environmental Protection," which formed the basis of the active legislative framework. For the harmonization with the EU's order 88/609 concerning emission limitations, the Government has executed the Ministry decision 58751/2370/15.4.93 which also includes the limits of the main pollutants from electric powerplants.

Individual industrial concerns were charged with much of the responsibility of environmental protection. The Public Power Corporation (PPC), a state-controlled agency, had projects underway for reducing sulfur dioxide emissions for powerplants in southern Greece and new electrostatic precipitators were being installed in the lignite powerplant operations in northern Greece. In central Greece, some fuel oil powerplant units were being modified to burn natural gas. In addition, several new projects using wind power were presently under development on the islands of the Aegean Sea (Public Power Corporation, January 3, 1997, Overview/ Environment, accessed May 21, 1997, at URL http://www.newface. gr/ppc/environm.html).

The Government's decision to import natural gas from Russia and possibly Algeria was based, in part, on the fact that it is much cleaner to burn natural gas than the traditional lignite.

Bauxite mining operations continued through 1997. Bauxites Parnasse Mining Co. S.A. and the Silver and Baryte Ores Mining Co. S.A. merged into the Eliopoulos-Kyriacopoulos Group to form the largest mining company in Greece. However, both companies continued to operate independently. Parnasse's operations were mainly in the Itea area, and most of the production was exported. Silver and Baryte's operations were at Euboea, Helicon, and Parnassos. Delphi-Distomon S.A. continued to produce bauxite, which was sold to Aluminum de Grèce S.A.'s operation at Distomon.

Interest in gold exploration continued in 1997. The joint-venture project between Silver and Baryte and Renison Goldfields Consolidated Ltd. of Australia on the island of Milos was continuing with systematic sampling and investigation.

Northern Greece is thought to contain a significant amount of exploitable mineral resources and was receiving more attention in regards to exploration activities. According to the Institute of Geological and Mining Research, a number of multinational companies, such as RTZ-Angloamerican, Normandy-Poseidon, and Newmont Inc., expressed their interests in Greece's northern territories. A recent Greek-Bulgarian study confirmed the existence of gold and other mineral occurrences in the mountains of Rodopi Prefecture and Kaimaktsalan, along the Greek-Bulgarian border (Mining and Metals, February 1998, Greece's treasure chest, accessed April 9, 1998, at URL http://www.ana.gr/herms/1998/feb/mining.htm).

The Kassandra Group (Skouries and Olympias deposits) in northern Greece have produced lead, silver, and zinc for more than 30 years. The mines were bought in 1996 by TVX Hellas, an affiliate of TVX Gold Inc. of Canada, with the idea of exploiting the refractory gold ore by incorporating pressure oxidation technology into the ore-processing phase. TVX Hellas announced that, at the Skouries porphyry copper deposit, drilling had indicated a "geologic resource" of 568 million metric tons grading 0.47 grams of gold per metric ton and 0.35% copper equating to about 267,000 kilograms of gold and more than 1.9 million metric tons of copper. (These estimates did not indicate cutoff grades.) Also, surface and underground drilling continued at the Olympias deposit to confirm previous ore reserve information and the quality of the orebody. (TVX Gold Inc., April 10, 1997, Greek projects update, accessed May 21, 1997, at URL http://www. tvxgold.com/pr041097.hmtl).

The Kassandra ore bodies are massive sulfide strata bound replacement deposits, and occur within marble layers interbedded with gneiss and amphibolite in the Kerdyllia Formation of the Serbo-Macedonian Massif, a series of Paleozoic and older rocks. Gold mineralization in the Olympias deposit is associated with arsenopyrite and pyrite. The deposit consists of two zones. The west zone is lensoid in shape, averages 11 meters (m) in thickness, 350 m along strike and 1,500 m downdip, and is on the west flank of an anticline. The east zone 300-m distance, is arc-shaped, and averages 9 m in thickness, 250 m along strike and 550 m downdip (Northern Miner, 1997).

LARCO S.A. was a major partner in a research project financed by the EU to develop an expert system for the exploration of nickel ore. LARCO accounted for about 3% of world nickel production and exported it in the form of nickeliferrous ores to European industries.

The Hellenic Mineral Mining Co. continued asbestos mining operations at the Zidani Mine near Kozani. Most of the various grades of asbestos fibers produced were exported. The fibers are suitable for mixed applications, such as asbestos cement pipes and roofing applications.

Two companies produced industrial minerals. Barytine Co. the leading producer, is a major producer of bentonite, kaolinite, and perlite most of which comes from the island of Milos. Lava Mining and Quarrying Ltd. specialized in industrial minerals with production of gypsum from the island of Crete, pozzolan from Milos, and pumice from the island of Yali.

Financial-Mining-Industrial and Shipping Corp., a state-controlled company, was acquired by Viomagn-Fimisco Ltd., a joint venture of the lignite producer Violignit S.A. and Alpha Ventures of the Alpha Credit Bank, Greece's largest investment bank. Viomagn will invest $19.7 million to revive output of firebricks and high-quality dead-burned magnesite. Violignit had a 65% interest in Viomagn, with the rest held by Alpha Ventures (Financial Times, 1997a).

The Greek marble industry continued to expand in 1997. It played a leading role in the international dimension stone market as a result of the marble's production in almost all areas of the country, variety of uses, and many colors (ash, black, brown, green, pink, red, and multicolored).

The industry was active in three steps of processing: the quarrying and the cutting of marble blocks and the sale of the blocks and finished products. About 80% of the marble was sold as finished products; the remainder was sold in rough slab and block form.

Silver and Baryte announced it had begun production of natural zeolite in northern Greece. The 50,000-metric-ton-per-year operation will produce five grain sizes of clinoptilolite, which has a high cation exchange capacity owing to its honeycomb crystalline structure (Industrial Minerals, 1997).

PPC was the exclusive producer of lignite, the predominant fuel in electricity generation in Greece. PPC continued exploration in the basins of Amyntaion, Elasson, Florina, Megalopis, and Ptolemais in 1997. PPC had reserves estimated to be 6.8 billion tons from which 4 billion tons was estimated to be economically recoverable by open-pit mining. (Public Power Corporation, May 5, 1997, Overview/ lignite mines, accessed March 5, 1998 at URL http://www. newfaces.gr/ppc/mines.hmtl).

In early 1997, Greece started receiving natural gas from Russia via a $2.7-billion pipeline that took 10 years to complete. The 520 kilometer (km) pipeline which runs south from the Bulgarian border to Athens will furnish 2.4 billion cubic meters per year of natural gas for 25 years from Gazexport, the Russian supplier. As a back-up supply, Greece will buy up to 0.6 billion cubic meters of liquefied natural gas from Sonatrach, the Algerian state gas company, which will be stored on an island near Athens (Financial Times, 1997b). Greece is the last EU country to start using natural gas.

In the petroleum sector, Public Petroleum Corporation opened bidding for concessions and received offers for three onshore areas: Achaia, Aitoloakarnania, and Epirus, and three offshore areas, south of Corfu, Katakolon, and Patraikos Bay.

The railroad system in Greece, all Government owned, totaled 2,479 km, of which 1,565 km was 1.435-m standard-gauge track, 892 km 1.000-m gauge track, 100 km of double track, and 22-km was 0.750-m narrow-gauge track. The highway and road system totaled 38,938 km, of which 16,090 km was paved, 13,676 km was crushed stone and gravel, 5,632 km was improved earth, and 3,540 km was unimproved earth. The 80-km inland waterway system consisted of three coastal canals and three unconnected rivers. The major ports are Piraeus and Thessaloniki.

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Major Source of Information

Institute of Geology and Mineral Exploration
70 Messoghion St.
11527 Athens, Greece

TABLE 1
GREECE: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/		1993	1994	1995	1996	1997 e/
METALS						
Aluminum:						
Bauxite		2,205,498	2,196,371	2,200,216 r/	2,451,734 r/	2,211,200 3/
Alumina, Al_2O_3 equivalent		614,900	548,000	597,620 r/	601,580 r/	602,000
Metal:						
Primary		147,690	144,300	130,361 r/	141,295 r/	142,000
Secondary e/		3,000	3,000	3,000	3,000	
Chromite:						
Run-of-mine		3,500 e/	--	--	11,725 r/	12,000
Marketable products, concentrate		3,697	1,960	--	--	--
Iron and steel;						
Iron ore and concentrate, nickeliferous, Fe content e/ 4/		575,000	810,000	800,000	800,000	700,000
Metal:						
Steel, crude		1,031,000	847,612	939,170	950,000 e/	950,000
Ferroalloys, ferronickel e/		52,067	64,728	68,620	71,204	70,000
Lead, mine output, Pb content by analysis		28,812	28,404	20,400	11,541 r/	19,300
Manganese: e/						
Ore, crude:						
Gross weight		9,705 r/	8,600	9,850 r/	11,000 r/	10,000
Mn content		2,082	1,960	2,130 r/	2,572 r/	2,500
Concentrate:						
Gross weight		2,600 r/	2,400 r/	2,500	2,000 r/	2,000
Mn content		1,985 r/	1,768 r/	2,035 r/	1,443 r/	1,443
Nickel:						
Ore:						
Gross weight		1,570,000	1,944,018	2,069,488 r/	2,194,829 r/	2,000,000
Ni content of nickeliferous iron ore		12,940	18,182 r/	19,941	17,801 r/	17,600
Metal, Ni content of ferronickel		10,931	16,197	17,164	17,801 r/	18,000
Silver, mine output, Ag content	kilograms	53,500	44,900	33,000	16,600 r/	35,900
Tin, metal, secondary e/		200	150	150	150	150
Zinc, mine output, Zn content by analysis		24,854	17,200	14,500	13,602 r/	17,800
INDUSTRIAL MINERALS						
Abrasives, natural, emery e/		7,100	7,500	-- r/	-- r/	--
Asbestos:						
Ore		3,626,000	4,647,033	4,920,650 r/	4,862,799 r/	4,800,000
Processed, fibers		56,940	55,502	75,003 r/	80,213 r/	80,000
Barite:						
Ore, crude		988 r/	701 r/	668 r/	671 r/	800
Concentrate		849 r/	641 r/	600 r/	530 r/	600
Cement, hydraulic	thousand tons	12,618	12,636	12,000 e/	12,000 e/	12,000
Clays:						
Bentonite:						
Crude		677,578	697,773	1,115,119 r/	973,517 r/	950,000
Processed		521,115 r/	583,140	512,000 r/	764,578 r/	750,000
Kaolin:						
Crude		89,473	117,254	68,682 r/	60,453 r/	60,000
Processed		735 r/	651 r/	314 r/	300 r/	300
Feldspar		22,210 r/	35,000	27,000 r/ e/	30,000 e/	30,000
Gypsum and anhydrite		445,600	453,722	485,353 r/	546,344 r/	500,000
Magnesite:						
Crude		479,999	575,472	565,720 r/	682,346 r/	650,000
Dead-burned		66,058 r/	76,965 r/	69,543 r/	57,438 r/	58,000
Caustic-calcined		123,797 r/	151,559 r/	206,532 r/	120,072 r/	125,000
Huntite e/		12,500	11,500	12,500	12,500	13,000
Nitrogen, N content of ammonia		57,400	45,200	64,900 e/	90,400 e/	82,700 2/

See footnotes at end of table.

TABLE 1--Continued
GREECE: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/		1993	1994	1995	1996	1997 e/
INDUSTRIAL MINERALS--Continued						
Perlite:						
Crude		548,574	468,699	565,479 r/	598,640 r/	600,000
Screened		350,000	371,945	431,054 r/	417,882 r/	500,000
Pozzolan (Santorin earth)		600,000	649,608	691,722 r/	745,790 r/	750,000
Pumice		670,140 r/	635,470	856,450 r/	867,450 r/	1,000,000
Salt, all types		175,159	192,000	200,000 e/	200,000 e/	200,000
Silica e/		112,000 r/	80,250 r/	68,000 r/	86,600 r/	92,000
Sodium compounds: e/						
Carbonate		750	750	750	750	750
Sulfate		6,000	6,000	6,000	6,000	6,000
Stone:						
Dolomite		55,000	78,920	92,920	23,000	50,000
Marble	cubic meters	278,730 r/	160,181	379,502 r/	196,669 r/	200,000
Flysch		166,172	88,662	35,434	85,138	90,000
Quartz, processed		1,471	5,655	6,000	6,350	7,000
Sulfur:						
S content of pyrites		22,391 r/	25,637	18,737 r/	9,660 r/ e/	10,000
Byproduct:						
Natural gas e/		100,000	100,000	100,000	105,000 r/	52,000
Petroleum e/		9,000	5,000	5,000	10,000 r/	7,600
Total sulfur e/		131,391 r/	130,637	123,737 r/	124,660 r/	69,600
Talc and steatite e/		1,050 r/	400	-- r/	-- r/	--
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Lignite	thousand tons	54,817	57,533	56,533	54,732 r/	58,000
Lignite briquets		62,000	56,000	50,000	50,000 e/	50,000
Coke, gashouse e/		15,000	13,000	14,000	15,000	15,000
Gas:						
Manufactured, gasworks e/	million cubic meters	18	15	16	15	15
Natural	do.	82	38	35	38	43
Natural gas plant liquids	thousand 42-gallon barrels	290	360	350 e/	350 e/	350
Petroleum:						
Crude	do.	4,000 e/	3,900 e/	3,285	3,738	3,380
Refinery products:						
Liquefied petroleum gas	do.	4,650	5,450	5,500 e/	5,000 e/	5,000
Gasoline	do.	29,500	30,300	30,000 e/	30,000 e/	30,000
Naphtha	do.	1,230	4,670	4,500 e/	4,500 e/	4,500
Mineral jelly and wax e/	do.	15	15	15	15	15
Jet fuel	do.	10,100	12,700	12,000 e/	12,000 e/	12,000
Kerosene	do.	78	194	150 e/	150 e/	150
Distillate fuel oil	do.	24,300	27,800	26,000 e/	26,000 e/	26,000
Refinery gas e/	do.	2,100	2,100	2,000	2,000	2,000
Lubricants e/	do.	800	1,000	1,000	1,000	1,000
Residual fuel oil	do.	29,400	35,400	36,000 e/	36,000 e/	36,000
Bitumen e/	do.	1,500	1,500	1,500	1,500	1,500
Petroleum coke e/	do.	525	525	500	500	500
Other e/	do.	400	400	400	400	400
Refinery fuel and losses	do.	5,970	5,660	6,000 e/	5,500 e/	5,500
Total e/	do.	110,568	127,714	125,565	124,565	124,565

e/ Estimated. r/ Revised.

1/ Table includes data available through March 1998.

2/ In addition to the commodities listed, other crude construction materials are produced, but no basis exists for estimation of production.

3/ Reported figure.

4/ Iron content of the nickeliferous ore mined for its nickel content. There is no indication that this iron is recovered, except as the iron content of ferronickel.

TABLE 2
GREECE: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Alumina	Aluminium de Grèce S.A. (Pechiney of France, 60%)	Distomon, in Boeotia area	640
Aluminum	do.	do.	160
Asbestos	Asbestos Mines of Northern Greece S.A. (MAVE) (Hellenic Industrial Development Bank-Government, 95%; International Finance Corp., 5%)	Mines at Zidani, near Kozani	110
Barite	Silver and Baryte Ores Mining Co. S.A. (Eliopoulos-Kyriacopoulos Group)	Milos Island	10
Bauxite	Bauxites Parnasse Mining Co. S.A. (Eliopoulos-Kyriacopoulos Group)	Mines in Parnasse-Ghion-Pasha areas	2,000
Do.	Eleusis Bauxites Mines, S.A. (ELBAUMIN) (National Bank of Greece)	Plant in Drama and Eleusis; mines near Drama, Itea, Kimi, and Mandra	700
Do.	Delphi-Distomon S.A.; Hellenic Bauxites of Distomin S.A.; (Aluminium de Grèce S.A.) Delphi Bauxites S.A.	Opencast mines at Delphi-Distomon area	500
Do.	Am. E. Barlos-Bauxite Hellas Mining S.A.	Mines at Distomon (Elixon), Beotia; Plant at Distomon, Beotia	300 200
Bentonite:			
Crude	Mediterranean Bentonite Co. S.A. (Industria Chemica Mineraria S.p.A. , Italy)	Surface mines on Milos Island	20
Do.	Mykobar Mining Co. S.A. (MI Drilling Fluids)	Mines at Adamas, Milos Island Plants at Adamas, Milos Island	180 150
Do.	Silver and Baryte Ores Mining Co. S.A.	Mines at Adamas, Milos Island	500
Processed	do.	Plant at Voudia Bay, Milos Island	400
Cement	Halkis Cement Co. S.A.	Micro-Vathi plant, west-central Euboea	3,000
Do.	Halyps Cement S.A. (Ciments Français, France)	Paralia Aspropyrgos plant, Athens	800
Do.	Heracles General Cement Co. S.A. (Industrial Reconstruction Organization [IRO], 69.8%)	Plant at Milaki Plant at Volos	1900 4600
Do.	Titan Cement Co. S.A.	Elefsis plant, Athens area Kamari plant, Boeotia Patras plant, northern Peloponnesus Salonica plant, Salonica	400 2,600 1,900 1,650
Chromite	Financial-Mining-Industrial and Shipping Corp. (FIMISCO) (IRO)	Tsingeli Mines and plant near Volos	25
Gold, Au in concentrate	TVX Hellas (TVX Gold Inc., Canada)	Kassandra Mines (Olympias, Stratoni)	25
Ferroalloys:			
Ferronickel, Ni content	General Mining & Metallurgical Co. S.A. (LARCO) (IRO)	Larymna Metallurgical plant	25
Lead: Mine: Pb in concentrate	TVX Hellas (TVX Gold Inc., Canada)	Kassandra Mines (Olympias, Stratoni) northeast Chalkidiki	--
Lignite	Public Power Corporation (Government)	Aliveri Mine, Euboea Island Megalopolis Mine, central Peloponnesus Ptolemais Mine, near Kozani	420 7,000 28,000
Magnesite, concentrate	Viomagn-Fimisco Ltd. (Violignit S.A. 65%, Alpha Ventures 35%)	Mines at Gerorema, Kakavos, and Paraskevorema at Mantoudhi, northern Euboea Island	350
Do.	Magnomin-General Mining Co. S.A. (A subsidiary of Radex Eraclit Industrie Beteiligungs GmbH, Austria)	Mines at Vavdos, Chalkidiki Processing plant at Vavdos	68 60

TABLE 2--Continued

GREECE: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Manganese, (battery-grade MnO2 concentrate)		Eleusis Bauxite Mines Mining, Industrial and Shipping S.A. (National Bank of Greece [OAE])	Nevrokopi, Drama	4
Natural gas	million cubic meters per day	Public Petroleum Corporation (Government)	Prinos offshore gasfield and oilfield, east of Thasos Island	125
Nickel, ore		General Mining & Metallurgical Co. S.A. (LARCO) (IRO)	Agios Ioannis Mines near Larymna Mines at Euboea	500 2,500
Perlite		Silver and Baryte Ores Mining Co. S.A.	Kos and Milos Islands Plant at Pireaus	250 300
Do.		Otavi Minen Hellas S.A. (Otavi Minen AG, Germany)	Milos Island	120
Do.		Peletico Hellas S.A. (Peletico Ltd. of Cyprus)	do.	20
Do.		N. Bournas & Co.	Kos Island	75
Petroleum, refined	42-gallon barrels per day	Hellenic Aspropyrgos Refinery S.A.	Aspropyrgos	95,000
Do.	do.	Motor Oil (Hellas) Corinth Refineries S.A.	Aghii Theodori, Corinth	140,000
Do.	do.	Petrola Hellas S.A.	Eleusis	100,000
Do.	do.	Thessaloniki Refining Co. A.E.	Thessaloniki	76,000
Pozzolan (Santorin earth)		Lava Mining & Quarrying Co. Ltd. (Heracles General Cement Co. S.A.)	Quarries on Ghyali Island	800
Steel, crude		Halyvourgia Thessalias S.A. [A subsidiary of Manessis Bros. and Voyatzis S.A. (65%); the balance, 35%, owned by state-owned National Investment Bank for Industrial Development - (NIBID)]	Steelworks at Volos (operates two 35-metric-ton electric arc furnaces)	1,500 300 200
Do.		Halyvourgiki, Inc.	Steelworks at Eleusis (three 100-metric ton electric arc furnaces)	1,200
Do.		Helleniki Halivourgia S.A.	Steelworks at Aspropyrgos (two 55-ton electric furnaces)	400
Do.		Sidenor S.A. (also known as Halivorgia Voviou Ellados S.A.)	Steelworks at Nea Maguisia, near Thessaloniki (two 55-ton and two 30-ton electric arc furnaces)	350
Zinc: Mine: Zn in concentrate		TVX Hellas (TVX Gold Inc., Canada)	Kassandra Mines (Olympias, Stratoni) northeast Chalkidiki	25

THE MINERAL INDUSTRY OF

HUNGARY

By Walter G. Steblez

In 1997, Hungary continued to produce modest amounts of fossil fuels, industrial minerals, and metals. Bauxite was the only major nonfuel mineral produced in Hungary that was significant in terms of European mineral production. The country's production of primary aluminum, compared with output levels in the 1980's, had been reduced substantially owing to energy shortages. Coal, natural gas, and petroleum production was sufficient to satisfy only about one-half of the country's annual energy needs. Hungary had all but completed the transition to a market economy, which involved major structural economic changes. These changes, which took place mostly between 1991 and 1994, included the denationalization of state-owned enterprises in the industrial, agricultural, and service sectors and the severance of state subsidies to these sectors. The country's economic performance continued to show overall improvement, given the economy's dislocations and production downturns that took place in the early stages of transition to a market economy system from 1990 to 1993. Compared with those of 1996, Hungary's gross domestic product and industrial production in 1997 grew by 4.4% and 7%, respectively. In terms of physical units, the output of metals showed production declines for alumina, bauxite, crude steel, and manganese levels compared with respective output levels in 1996 and 1995 but showed an increase in the production of secondary aluminum metal. The output of mineral fuels was stable, with the exception of crude petroleum and natural gas, which declined by about 8% and 5%, respectively, compared with that of 1996. (*See table 1.*)

The Government of Hungary based its regulatory policies for mining and geological exploration and survey work on provisions in the Mining Law of 1993 (Act XLVIII). Section 50 of the Mining Law was the basis for Governmental Decree No. 132/1993, which, in turn, comprised the legislative basis for the Hungarian Geological Survey. The Mining Law and related decrees and codes established the legislative bases for estimating reserves, determining environmental risks associated with mining, and providing the geologic and technical information needed to outline tender conditions.

Government agencies that were responsible for enforcing existing environmental protection laws and regulations included the Ministry of the Environment and Regional Planning (KTM) and the Hungarian Mining Office (MBH). KTM was authorized to help only in the enforcement of existing environmental legislation prescribed by other ministries of the Government; however, with respect to mining and minerals, Hungary's Ministry of Industry and Commerce had the primary responsibility for establishing environmental regulatory standards. The chief responsibility of MBH was to review and certify the technical developmental and operational plans; these plans were required to include provisions pertaining to environmental protection and land restoration by responsible entities.

From 1993 to 1997, Hungary's mineral-commodity production trends showed increasing correspondence to market demands as opposed to those of central economic planning norms, which were required before 1990. Table 2 lists the names of the major operating companies in Hungary's minerals industry and provides their general location.

Following the decision by the Government to denationalize heavy industry enterprises, the process of privatization began to make headway in such large segments of Hungary's minerals industry as bauxite mining, alumina refining, and the mining and processing of industrial minerals. Major mineral industry activities in 1997 included a sale offer of the Ajka alumina refinery by the state-owned parent company, Hungarian Aluminum Industrial Corporation (HUNGALU); the awarding of gold exploration concessions to domestic and European Union companies; and continuing efforts to restart mining operations at the Lahoca gold-copper deposit. A full report on Hungary's minerals industry again will be presented for the year 1999.

TABLE 1
HUNGARY: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/		1993	1994	1995	1996	1997
METALS						
Aluminum:						
Bauxite, gross weight	thousand tons	1,561	836	1,015	1,056 r/	743
Alumina, gross weight, calcined basis	do.	421	177	184	208	76
Metal:						
Primary		27,879	30,740	25,000	30,000 r/	35,000
Secondary e/		25,000	3,000	4,000	63,808 r/ 3/	63,190 3/
Total		52,879	33,740	29,000	93,808 r/	98,190
Copper, metal: e/						
Smelter, secondary		100	100	100	100	100
Refined including secondary		11,000	11,000	11,000	11,000	12,000 3/
Gallium, mine output metal content	kilograms	7,000	5,577	4,187	5,000	–
Iron and steel, metal:						
Pig iron	thousand tons	1,407	1,590	1,515	1,548 r/	1,190
Ferroalloys e/ 4/		8,500	8,000	8,000	8,000	8,000
Steel:						
Crude	thousand tons	1,752	1,945	1,865	1,903 r/	1,689
Semimanufactures, rolled only	do.	1,835	2,074	2,117	2,133	2,229
Manganese ore:						
Run of mine:						
Gross weight		38,000	40,000	37,000	65,000 r/	57,000
Mn content e/		9,200	13,000	9,600	15,700 r/	14,000
Concentrate:						
Gross weight		59,000	25,000	25,000 e/	33,813 r/	15,291
Mn content e/		17,500	7,500	7,500	11,000	5,000
Uranium, U3O8 content		499	503	277	250	200
Zinc, metal, smelter, secondary e/		1,000	– 3/	–	–	–
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand tons	2,530	2,810	2,875	2,747 r/	2,811
Clays:						
Bentonite:						
Raw		9,404	14,700	22,792	15,376	14,848
Processed e/		8,000	12,000 3/	12,000	9,000	9,000
Kaolin, raw and washed		15,000	15,000	10,959	9,854	10,000
Gypsum and anhydrite		125,000	151,000	198,000	190,000 e/	190,000 e/
Lime, calcined	thousand tons	476	464	538	468 r/	498
Nitrogen, N content of ammonia e/	do.	237 3/	250	250	250	250
Perlite		80,000	85,000	151,000	110,000 r/	120,000
Refractory materials, n.e.s.:						
Chamotte products	thousand tons	20	20	19	20 e/	20 e/
Chrome magnesite products	do.	3	5	4	5 e/	5 e/
Sand and gravel:						
Gravel	do.	8,000 e/	8,103	10,906	11,000 r/ e/	10,000 e/
Sand:						
Common	thousand cubic meters	200 e/	104	206	275	284
Foundry	thousand tons	15	12	159	9	73
Glass	do.	260	308	523	325	328
Sodium compounds:						
Hydroxide (caustic soda)		130,000	132,000	159,215	160,167	150,000
Sulfate		6,000 e/	–	–	–	–
Stone:						
Dimension, all types	thousand tons	4,030	5,206	4,967	5,000 e/	5,000 e/
Dolomite	do.	644	933	1,001	582	1,440
Limestone	do.	3,920	4,273	4,340	4,949 r/	4,941
Sulfur: e/						
From pyrite		800	–	–	–	–
Byproduct, elemental, all sources		8,000	30,890 3/	28,802 3/	28,000	30,000
Total		8,800	30,890 3/	28,802 3/	28,000	30,000
Sulfuric acid		71,300	83,700	106,737	89,712 r/	84,463
Talc		1,800	1,500 e/	1,150	1,200 e/	500

See footnotes at end of table.

TABLE 1--Continued
HUNGARY: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/		1993	1994	1995	1996	1997
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Bituminous	thousand tons	942	1,024	844	962	924
Brown	do.	6,600	5,710	6,458	6,538 r/	6,552
Lignite	do.	5,050	6,760	7,151	7,575	8,089
Total	do.	12,592	13,494	14,453	15,075 r/	15,565
Coke, metallurgical e/		643 3/	650 3/	650	650	650
Fuel briquets	thousand tons	605	410	362	323 r/	214
Gas, natural, marketed	million cubic meters	5,010	5,900	5,451	4,756 r/	4,513
Peat, agricultural use e/	thousand tons	65	65	48 3/	45 r/	50
Petroleum:						
Crude:						
As reported	do.	1,710	1,600	1,669	1,477	1,355
Converted	thousand 42-gallon barrels	11,400	10,700	10,800	9,800 e/	9,100 e/
Refinery products 5/	do.	41,200	41,000	41,000	40,000 e/	40,000 e/

e/ Estimated. r/ Revised.

1/ Table includes data available through April 1999.

2/ In addition to the commodities listed, diatomite and a variety of other crude construction materials, such as common clays, are produced, but available information is inadequate to make reliable estimates of output levels.

3/ Reported figure.

4/ Hungary is believed to produce some blast furnace ferromanganese.

5/ Excludes refinery fuel and losses.

TABLE 2
HUNGARY: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Alumina	Hungarian Aluminum Industrial Corp. (HUNGALU)	Ajka Timfoldgyar plant, about 120 kilometers southwest of Budapest, near Lake Balaton	400
Do.	do.	Almasfuzito Timfoldgyar plant near the Czech Republic border, 63 kilometers northwest of Budapest	240
Do.	do.	Moson-Magyarovar plant, in northwestern corner of Hungary, about 12 kilometers from Austrian and Czechoslavak borders	30
Aluminum, primary	do.	Inota plant, near Varpalota, 75 kilometers southwest of Budapest	46
Bauxite	HUNGALU: Bakony Mining Enterprise	Bakony District, extending roughly 100 kilometers northeast along Lake Balaton	1,500
Cement	Belpafatvalvi Cement es Meszipari Rt Principal investors: Heidelberger & Schwenk (Germany) and Hungarian Group	Belapatfalva, near Miskolc, 125 kilometers northeast of Budapest	1,100
Do.	Beremend Cement es Meszipari Rt Principal Investors: 100%-owned by Heidelberger & Schwenk (Germany)	Beremend, 45 kilometers south of Pecs	1,090
Do.	Dunai Cement es Meszmu Kft Principal Investors: 100%-owned by Heidelberger & Schwenk (Germany)	Vac, 50 kilometers north of Budapest	1,200
Do.	Hejocsabai Cement es Meszipari Rt Principal Investors: Holderbank (Germany) & Hungarian Group	Hejoscaba, 150 kilometers northeast of Budapest	1,450
Do.	Labatlani Cementipari kft Principal Investors: 100%-owned by Holderbank (Germany)	Labatlan, 20 kilometers north of Tatabanya	550
Clays	Agyag-Asvany Kft Principal Investors: Navan Resources PLC (Ireland)	Felsopeteny, one underground and two open-pit mines and 5,000- tons- per year processing plant. Products: ball clay, kaolin, and refractory clay	35
Coal:			
Bituminous and lignite	Magyar Szenbanyaszati Troszt (MSZT) (Hungarian Coal Mining Trust)	Tatabanya and Oroszlany coal mining region, 45 kilometers west of Budapest	8,900
Do.	do.	Mecsek coal mining region, near Pecs and Komlo, north of the Yugoslav border	3,100
Do.	do.	Borsod coal mining region, 130 kilometers northeast of Budapest	5,200
Lignite	do.	Thorez opencast mine at Visonta, 80 kilometers northeast of Budapest	7,000
Manganese	Orszagos Erc-es Asvanybanyak (National Ore and Mineral Mines)	Urkut manganese ore mines, 120 kilometers southwest of Budapest	160
Natural gas million cubic feet	Hungarian Oil and Gas Co. (MOL)	Szeged and Algyo gasfields, southern Hungary	152,000
Do.	do.	Hajduszoboszo gasfields, 180 kilometers east of Budapest	50,000
Do.	do.	Smaller gasfields- Szank, Kardoskut, Bekes, Berefurdo, and others	39,000
Perlite	Perlit 92 Kft Principal Investors: Navan Resources PLC (Ireland) and Hungarian Group	Palhaza, northeastern Hungary. Open-pit mine and processing plant	150

TABLE 2-- Continued
HUNGARY: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand of metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Petroleum:				
Crude	million barrels	Hungarian Oil and Gas Co. (MOL)	Szeged-Algyo field, near Romanian-Yugoslav border; 50% of total capacity	7
Refined:		Subsidiaries of MOL:		
Do.	do.	Danube Petroleum Refining Co.	Szazhalombatta	55
Do.	do.	Tisza Petroleum Refining Co.	Leninavaros	22
Do.	do.	Zala Petroleum Refining Co.	Zalaegerszeg	4
Silica		Uveg-Asvany Kft Principal Investors: Navan Resources PLC (Ireland) and Hungarian Group	Mine and plant at Fehevaresugo	660
Steel		Dunaferr Dunai Vasmu Rt	60 kilometers south of Budapest	1,400
Do.		OAM-Ozdi Acelmuvek Kft	120 kilometers northeast of Budapest	360
Do.		DNM-Diosgyori Acelmuvek es Kereskedelmi Kft	Diosgyoer, 145 kilometers northeast of Budapest	850

THE MINERAL INDUSTRY OF

ICELAND

By Harold R. Newman

Owing to abundant hydroelectric and geothermal energy and the lack of domestic resources, the mineral industry of Iceland largely comprised metal production from imported materials. Nearly all production of aluminum and ferrosilicon was exported. Iceland has few proven mineral resources, although deposits of diatomite were being developed. All production of industrial minerals, with the exception of diatomite, was used by local industries. (*See table 1.*) For more extensive coverage of the mineral industry of Iceland, see the 1996 Minerals Yearbook, International Review of Europe and Central Eurasia, Volume III.

TABLE 1
ICELAND: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
Aluminum metal, primary 2/		94,480	99,294	100,101	103,800	104,000
Cement, hydraulic 3/		85,531	80,856	81,514	88,200 r/	88,000
Diatomite		19,000 e/	24,566	28,142	25,600 r/	26,000
Ferrosilicon		67,400	66,003	71,410	68,000	68,000
Nitrogen, N content of ammonia		8,700 e/	8,966	8,800 e/	9,000 e/	9,000
Pumice and related volcanic material: e/						
Pumice		45,000	23,000	30,000	25,000	25,000
Scoria		500	500	500	500	500
Salt e/		4,500	4,500	4,000	4,000	4,000
Sand:						
Basaltic	cubic meters	--	300	1,300	1,200 e/	1,200
Calcareous, shell	do.	81,300	81,451	83,651	82,000 e/	82,000
Sand and gravel e/	thousand cubic meters	3,600	3,600	3,600	3,600	3,600
Silica dust 4/		10,000 e/	13,871	14,346 r/	14,000 e/	14,000
Stone, crushed:						
Basaltic e/		100,000	114,000	91,000	90,000	90,000
Rhyolite	cubic meters	16,500	19,355	16,552	16,500 e/	16,500

e/ Estimated. r/ Revised.
1/ Table includes data available through March 1998.
2/ Ingot and rolling billet production.
3/ Sales.
4/ Byproduct of ferrosilicon.

TABLE 2
ICELAND: STRUCTURE OF THE MINERAL INDUSTRY FOR 1997
(Thousand metric tons)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	ISAL (Alusuisse-Lonza Holding Ltd., 100%)	Straumsvik	100
Cement	Sementsverksmidja Rikisins (Government, 100%)	Akranes	115
Diatomite	Kisilidjan hf (Government, 98%)	Myvatnssveit	27
Fertilizer	Aburdarverksmidja Rikisins (Government, 100%)	Gufunes	60
Ferrosilicon	Islenska jarnblendifelagid hf (Government, 55% and Elkem A/S, 30%)	Plant at Grundartangi	72
Pumice	Eldber hf (Jardenfnaidnadur hf, 51%)	Mount Hekla	210
Do	Pumice Products Ltd. (BM Valla Ltd., 100%)	do.	32
Salt	Icelandic Salt Co. (Akzo NV of Netherlands, 58%)	Plant at Svartsengi	5

THE MINERAL INDUSTRY OF

IRELAND

By Harold R. Newman

Ireland remained a major European Union producer of zinc and an important producer of alumina, lead, and peat in 1997. Although the range of minerals exploited in the country has been limited, exploration activity for new mineral resources continued to increase, mainly focused on gold, lead, and zinc. The country's mineral-processing industry was small, as was the demand for and consumption of mineral products.

Base metal exploration continued to be the main mineral exploration activity; gold exploration was continuing. The upswing in activity in the lead and zinc sector resulted in the development of new mines and the investigation of several other potential projects. The Department of Transportation, Energy, and Communication (1997b) reported that 402 Prospecting Licenses, 16 State Mining Leases, and 1 Mining License had been issued for 1997. The main License holders were BHP Minerals International Exploration Inc., Navan Resources/CEC (Ireland) Pty. Ltd., and Tara Mines Ltd.

Ireland's base-metals production, formerly centered mainly on Outokumpu Oyj's Tara zinc-lead mine, increased when Arcon International Resources plc's Galmoy zinc-lead mine came on-stream in 1997. Industrial mineral production, including barite and gypsum, remained relatively constant. Several metals and industrial minerals projects were awaiting the granting of planning permission and mining leases before moving into development and production. Natural gas production continued off the southern coast of Ireland, near Cork. Reserves were not disclosed, and the production from the fields was being carefully managed to extend the life of the area. (*See table 1.*)

The Geological Survey of Ireland (GSI) was responsible for the development of mineral information and for technical management of the state mineral licensing and leasing system. GSI also provided technical assistance to the exploration and mining industries.

Ireland's geology includes several lithological units and tectonic features that are favorable for the occurrence of several types of mineral resources. Interest in gold, lead, and zinc exploration provided the impetus for the revitalization of the exploration sector within the past few years. *(See table 2.)*

Aughinish Alumina Ltd.'s (AAL) production of alumina was based on imports of bauxite from Guinea and Brazil. The major markets for AAL's alumina were primary aluminum smelters. British Alcan Aluminium plc. purchased 65% of the refinery's output for its smelter in the United Kingdom, and Billiton Aluminium Ireland Ltd. purchased the remaining 35% for its smelter in Norway.

Irish Marine Oil plc. (IMO) was the leading Irish mineral exploration company, holding interests in 52 licenses in Ireland. Exploration efforts were directed mainly toward zinc, although IMO was the most active explorer for gold in Ireland with licenses in Counties Donegal, Kerry, Wexford, and Wicklow. IMO reported that its prospecting program had encountered numerous boulders containing high grade gold values some in excess of 30 grams per metric ton (g/t) of gold. Also, drilling near Carnew on the Wexford/Wicklow border had intersected four narrow veins all of which assayed from 1 g/t to 11.65 g/t over a width of 0.38 meter (m) (Irish Marine Oil plc, 1997).

The former Irish Steel Company was acquired by Ispat International Group in December 1995 and started operating as Irish Ispat in May 1996. Irish Ispat planned to invest $31 million during 6 years and has spent $6 million so far. The current interest was improving the infrastructure, environmental items, and upgrading the melt-shop and the rolling mill. Around 70% of expenditure went for infrastructure and 30% on development in 1997 and was expected to shift to 50% each in 1998, and 30% and 70% respectively, in 1999 (Metal Bulletin Monthly, 1997a).

Ireland produced more than 3% of world zinc mine output and more than 2% of world lead output, a situation that was expected to increase as the Galmoy and the Lisheen Mines come into full production. Tara Mines Ltd. was one of the largest lead-zinc producers in Europe. The Tara Mine, brought into production in 1977, was the largest producing zinc mine in Europe.

Europe's newest zinc mine, Arcon's Galmoy Mine in County Kilkenny, began underground mining in the first part of 1997. Galmoy's orebodies, CW, G, G-East, and K-Zone, are hosted by lower Carboniferous limestones and lie at the base of the Waulsortian limestone formation. Areas of the mineralization footwall extend several meters down into the underlying upper Ballysteen limestone formation. The CW ore body, where mining was started, has estimated reserves of 4.1 million metric tons and an estimated mine life of 6 years. Average grade of the ore was 11.3% zinc and 1.1 % lead. The ore body can be envisaged as a 450- by 750-m oval saucer tilted at an angle of around 10^0. The seam thickness ranges from 4 to 12 m, with an average of 6 m, at an average depth of 70 m from the surface. Its shape and orientation mean that minimal waste rock is generated, contributing significantly to lower production costs. At full production, the mine was expected to produce 135,000 metric tons per year (t/yr) of 54.5% zinc concentrate (Metal Bulletin Monthly, 1997).

The joint-venture Lisheen lead-zinc underground mine project, involving Ivernia Lisheen plc and Minorco Lisheen Ltd., continued. The Lisheen Mine is on the same mineralized trend as the Galmoy Mine, 8 kilometers (km) away. Minorco Lisheen held a 50% interest in the project and was the manager of the project. Lisheen was granted a mining lease, and construction began initiated on part of the project in late 1997. The $247 million construction program was due to be completed in time for production to start in June 1999. The Lisheen Mine has a projected life of 14 years at an operating capacity of 120,000 t/yr (Mining Journal, 1997).

Ireland produced significant quantities of synthetic diamond. Output was not quantitatively reported, and information was not available to make reliable estimates of production. The two companies that manufacture industrial diamonds and super abrasives were De Beers Industrial Diamonds Div. (Ireland), a subsidiary of De Beers Consolidated Mines (Pty.) Ltd. of South Africa, and GE Superabrasives Ireland, a subsidiary of General Electric Co. of the United States.

A range of abrasives was produced from synthetic diamond, cubic boron nitride, and polycrystalline diamond. All production was for the export market.

Cambridge Mineral Resources of the United Kingdom reported a discovery of diamond indicator minerals and sapphires from its heavy-mineral stream sediment sampling project in the Inishowen area, County Donegal. The company reported that the kimberlite and lamproitic indicator minerals were present at all sample locations, diamond indicator minerals were identified at two sample locations, and small blue sapphires were discovered at one location. Cambridge submitted a formal request for additional prospecting licences in the Inishowen area (Mining Journal, 1997).

Coal production was not recorded during 1997. Indigenous natural gas production continued from the Kinsale Head and the Ballycotton gasfields.

Ireland has a good network of roads supplemented by a Government-owned railroad. The two deep water ports at Cork and Dublin are supplemented by 10 secondary ports. Most mine sites are easily accessible and no more than 600 km from either deep water port.

The mineral industry is expected to use the opportunities created by the boom in gold and lead-zinc exploration and by renewed interest from multinational companies to continue mineral developments. GSI has an active data collection program through mapping and resource-related studies and offers technical assistance. This should continue to be a significant benefit and encouragement to companies engaged in mineral-resource activities.

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Geological Survey of Ireland
Beggars Bush, Haddington Road, Dublin 4, Ireland.

TABLE 1
IRELAND: PRODUCTION OF MINERAL COMMODITIES 1/

(Thousand metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
METALS						
Alumina		1,103	1,140	1,186	1,234	1,273 2/
Iron and steel, steel, crude		326	316	309 r/	340	337 2/
Lead:						
Mine output, Pb content		48,300	53,700	69,067	45,344 r/	45,149 2/
Metal, refined, secondary e/		12,000	11,000	11,000	10,400	10,500
Silver, mine output, Ag content	kilograms	13,000	17,400	13,700	14,706	13,284 2/
Zinc, mine output, Zn content		194,000	194,500	184,100	164,168 3/	194,796 2/
INDUSTRIAL MINERALS 3/						
Barite		53	--	--	--	--
Cement, hydraulic e/		1,600	1,550	2,100	2,100	2,000
Gypsum		318	325	406	422	477 2/
Lime e/		100,000	100,000	100,000	100,000	100,000
Nitrogen, N content of ammonia		367	380	408 r/	377 r/	465 2/
Sand and gravel e/ 4/		7,500	7,800	10,000	12,000	12,000
Stone and other quarry products: e/						
Limestone	million tons	1	1	1	1	1
Other e/ 5/		25,000	30,000	30,000	40,000	35,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, anthracite and bituminous		500	100 r/	-- r/	-- r/	--
Gas, natural, marketed	million cubic meters	2,690 r/	2,710 r/	2,826 r/	2,737 r/	2,417 2/
Peat:						
For horticultural use		300 e/	250	300 e/	300	300
For fuel use: e/						
Sod peat 6/		1,000	1,200	1,142	1,702	1,500
Milled peat 7/	thousand tons	5,500	5,000	5,000	4,876 r/	2,551 2/
Total	do.	6,500	6,200	6,142	6,578 r/	4,351
Peat briquets e/	do.	400	400	365	285 r/	253 2/
Petroleum refinery products: 8/						
Liquefied petroleum gas	thousand 42-gallon barrels	325	360	350 e/	350	350
Naphtha e/	do.	350	350	350	350	350
Gasoline, motor	do.	3,120	3,000	3,000 e/	3,000	3,000
Distillate fuel oil e/	do.	5,000	5,000	5,000	5,000	5,000
Residual fuel oil	do.	4,540	5,470	5,500 e/	5,000	5,000
Refinery fuel and losses e/	do.	400	400	400	400	400
Total e/	do.	13,735	14,580	14,600	14,100	14,100

e/ Estimated. r/ Revised.

1/ Table includes data available through May 1998.

2/ Reported figure.

3/ Ireland also produces significant quantities of synthetic diamond and is the major supplier to the United States. Output, however, is not quantitatively reported, and general information is inadequate to make reliable estimates of output levels.

4/ Excludes output by local authorities and road contractors.

5/ Includes clays for cement production, fire clay, granite, marble, rock sand, silica rock, and slate.

6/ Includes production by farmers and by Bord Na Mona (the Government Peat Board).

7/ Includes milled peat used for briquet production.

8/ From imported crude oil.

TABLE 2
IRELAND: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facility	Annual capacity
Alumina		Aughinish Alumina Ltd. (Alcan Aluminium Ltd.)	Aughinish Island, County Limerick	800
Barite		Magobar Ireland Ltd.	Silvermines, County Tipperary	240
Cement		Irish Cement Ltd.	Plants in Limerick and Platin	2,000
Lead-zinc		Arcon International Resources plc	Galmoy Mine, County Kilkenny	135
Do.		Outokumpu Oyj	Tara Mine, Navan, County Meath	215
Natural gas	million cubic feet	Marathon Oil Co.	Kinsale Head Field, Celtic Sea	75,000
Peat		Bord Na Mona (Government Peat Board)	Production mainly in midlands	4,200
Petroleum, refined	barrels per day	Irish Refining Co.	Whitegate, near Cork	56,000
Steel		Irish Ispat (Ispat International Group)	Haulbowline, near Cork	500

THE MINERAL INDUSTRY OF

ITALY

By Harold R. Newman

Italy has been a significant processor of imported raw materials, as well as a significant consumer and exporter of mineral and metal semimanufactured and finished products. It was the world's largest producer of pumice and related materials, producing almost one-half of the world's output, as well as the world's largest feldspar producer, producing about one-fourth of the world's output. The country was the world's eighth and ninth largest producer of crude steel and cement, respectively. Italy was also an important producer of dimension stone and marble.

Italy's gross domestic product, adjusted for inflation, grew at a rate of 1.0% in 1997, up from the 0.7% rate of 1996, as the Italian Government continued to exercise budget austerity and to reduce its role in the economy through privatization of its assets. This included the privatization of Ilva, a major steel producer (U.S. Department of State, Government role in the economy, accessed January 13, 1998, at URL http:// www.state.gov/www/about_state/business/com_guides/1997/europe_canada/italy97.html).

Growth in Italy's mining and extractive industries was minimal in 1997. Among the metallic ores, lead was mined, although production was minimal and decreasing. Most of the output comes from the Silius Mine in Sardinia. A small output of zinc ore comes from the safety and environmental recovery work in the remaining sites in the Iglesias area of Sardinia.

Industrial mineral production remained the most important sector with overall output remaining about the same as that of 1996. Domestic production of natural gas remained static while that of petroleum decreased slightly. *(See table 1.)*

Table 2 lists the relation of selected classes of mineral commodities on Italy's balance of payments position in relation to the European Union (EU) and the world.

Although Italy has significant trade in mineral commodities with EU countries and the rest of the world, it is principally a net importer of mineral commodities. Tables 3 and 4 list exports, including reexports, and imports of selected mineral commodities, respectively, in 1996, the latest date complete data were available.

Private and public companies own facilities for the mining and processing of minerals and mineral products. Some enterprises were under state control for economic reasons and to maintain employment. *(See table 5.)*

Alumina in Italy was produced only by Eurallumina S.p.A. at Portoscuso, Sardinia. The company was owned jointly by Alumix S.p.A. (52.1%) and by Australian interests. Almost all alumina in Italy was produced from imported bauxite, most of which was obtained from Australia and Guinea.

Alumix, part of the state holding company Eute Fiere Italiane Atacchine, was the only primary aluminum producer in Italy. As part of the Government's privatization efforts, the Aluminum Company of America (Alcoa) acquired the principal operating assets of Alumix in March. The primary aluminum assets, operated by Alcoa Italia S.p.A., included two smelters with a combined capacity of 180,000 metric tons per year (t/yr) at Porto Vesme and Fusina (Aluminum Company of America, 1997).

Other assets acquired in the transaction were a rolling mill with a capacity of 140,000 t/yr at Fusina; four aluminum extrusion plants with a combined capacity of 70,000 t/yr at Bolzano, Fossanova, Feltre, and Iglesias; an extrusion die shop at Mori, a network of six metal distribution centers in Italy; three administrative centers, and sales offices in France, Germany, Spain, and the United Kingdom (Aluminum Company of America, (untitled data), accessed February 4, 1998, on the World Wide Web at URL http://www.shareholder.com/alcoa/news/). Details on output and/or capacity were not readily available on Italy's several secondary aluminum producers.

Italy's refined copper production has averaged about 89,000 t/yr between 1993 and 1997. Enirisorse S.p.A., the largest producer of refined copper in Italy, accounted for about one-half of Italy's copper output. There are no significant copper mines in Italy, and imports of ore are small. Imported scrap, ashes, slag, and other residues were the major sources of the copper produced in Italy.

Gold Mines of Sardinia Ltd. (GMS), a joint venture of Gold Mines of Sardinia (70%) and Progemisa S.p.A. (30%), had completed construction of the main carbon-in-leach circuit and associated mill to recover gold and copper at its Furtei project, north of Cagliari. Furtei was the first gold mine of GMS and the first gold mine in Italy. Initial production was from a heap leaching pad. GMS poured its first bar of gold [23 kilograms (kg)] in May 1997. This was also the first pouring of a bar of gold produced by mining in modern Italian history. Some 1,400 kg of gold are expected to be recovered from the oxidized ores and an additional 700 kg of gold and 2,500 metric tons of copper in concentrates from the sulfide ores (Gold Mines of Sardinia Ltd., 1997).

Italy imported most of its supplies of lead and zinc concentrates, with Canada being the largest single source for these commodities. *(See table 4.)* Within Italy, most lead and zinc concentrate production came from Enirisorse's mines in Sardinia. Enirisorse's lead and zinc smelters were also on Sardinia, and the zinc electrolytic plant was near Venice. The Porto Vesme smelter on Sardinia produced primary lead and zinc metal and cadmium, and the San Gavino complex, near Porto Vesme, produced refined lead and byproducts, such as bismuth, gold, and silver.

Enirisorse was negotiating the sale of its Porto Vesme zinc smelter and its San Gavino lead smelter with Glencor of Switzerland. Glencor was selected after submitting the best offer in a privatization tender (Mining Journal, 1997).

Italy was the second largest producer of crude steel in the EU after Germany. About 60% of steel in Italy was produced by electric arc furnaces, and 40% was produced by basic oxygen furnaces. In Italy, all the steel was produced by private companies following the completion of a privatization program by the Government between 1992 and 1997 (Scruffier, 1997).

Iron ore was imported in 1997, Brazil supplied 50%, Mauritania 19%, and Australia 8%. *(See table 4.)* The country's steel industry also imported about 5 million metric tons (Mt) of scrap, mostly from Austria, France, and Germany.

Italy was the second largest cement producer in the EU, following Germany. Italcementi-Fabbriche Riunite Cemento S.p.A. was the largest of Italy's 52 cement producers, with about 40% of the Italian market. *(See table 5.)* Exports, however, were up (International Bulk Journal, 1997). Italy was a net exporter of cement. *(See table 3.)*

Most of Italy's bentonite ores were mined on Sardinia; processing plants were on the mainland. More than one-half of the country's bentonite production came from Industria Chimica Carlo Laviosa S.p.A. The company's main mining activity was in the Pedra de Fogu and the Puntenuova areas of Sardinia. Production from these areas fed the processing plants at Livorno, Oristano, and Sardinia.

Montmorillonite clay (white bentonite) was quarried at S'Aliderru in northwestern Sardinia. Caffaro S.p.A., operating in Sardinia, was Italy's only producer of acid-activated montmorillonite. The clay was shipped to the company's plant at Porto Marghera near Venice. Several small bentonite producers operated on the mainland at Foggia, Pietracuta di S. Leo, and Puglia.

Italy was the world's leading producer of feldspar and feldspathic minerals. These materials are important constituents of ceramic tile. Italy accounted for 30% of world tile output and more than 50% of the total tile produced in the EU. The more than 350 small companies producing tiles employed about 30,000 workers. Major sources for clay imports were, in declining order of importance, the United Kingdom, Germany, and the United States.

Italian marble occurs in many localities from the Alps to Sicily and is quarried at hundreds of operations. The most important geographic area for producing white marble is in the Apuan Alps in Tuscany, particularly near the town of Carrara. The Lazio region of Lombardy, the Po Valley, Puglia, Sicily, and Venice are important colored-marble-producing areas. About one-half of production was in block form. About one-half of the total production was exported. Other major marble-producing areas include the Valle di Susa, near Turin in the northwestern Italian Alps; the valley of the Po River in the region of Lombardy; the Verona-Vicenza area of Venice; and the vicinity of Benevento, northeast of Naples in southern Italy. Relative to consumption rates, resources are considered to be extensive.

Production of potash continued to remain suspended in 1997. The main reasons were the result of a severe drought that has restricted the availability of process water to the plants and the inability to remove waste material and mine water owing to environmental and ecological concerns. In Sicily, the three underground mines that were previously operating at Pasquasia, Racalmuto, and Realmonte remained on standby.

Italy was the world's leading producer of pumice and pozzolan. The Mediterranean island of Lipari, 40 kilometers (km) off the northern coast of Sicily, was the center of the Italian pumice industry, where two companies, Pumex S.p.A. and Sta Siciliana per l'Industria ed il Commercio della Pomice di Lapari S.pA. (Italpomice S.p.A.), quarried pumice for world markets. Pumex, with about a 650,000-t/yr capacity, was Italy's largest pumice producer. The company quarried the Mount Pelato deposit, and Italpomice produced about 70,000 t/yr of pumice at Acqualcalda.

Talco e Grafite Val Chisone S.p.A. operated two underground talc mines at Pinerolo near Turin. The white talc, mined from metamorphic rocks, has been of very high quality. Talco owned a 10% interest in an open pit mine at Orani, Sardinia, with the other 90% belonging to the Sardinian Mining Board. Talco also operated an underground mine at Fontane. Industria Mineraria Italiana S.p.A. operated mines at Largone and Predaccia, Val Malenco, northern Italy. Talco Sarda S.p.A. operated a mine at Orani.

Italy was heavily dependent on imported coal. Most imports were, in declining order of importance, from Russia, South Africa, the United States, and China. Lignite coal was produced by Ente Nazional per L'Energia Electrica (ENEL). Extraction problems and environmental reasons caused a further reduction in output from ENEL's Santa Barbara mine in Tuscany, the only lignite mine in Italy.

Geothermal energy was produced in the Larderello, the Monte Amiata, and the Travale areas in Tuscany. Exploration using various geologic techniques have been actively pursued in these areas along with research for power stations exploiting geothermal energy.

More than 100 natural gasfields were in operation; 70% was located offshore. About 35% of Italy's natural gas demand was met from domestic production. Algeria supplied more than 25% of Italy's natural gas needs through a 1,070-km-long natural gas pipeline from Algeria to Mazzara del Vallo in Sicily. Former Soviet Union countries supplied about 25% of the country's natural gas through a pipeline across Austria and the Czech Republic.

Despite increasing domestic production of crude oil, Italy was almost totally dependent on imported crude oil for its needs. Some 75 Mt of crude oil were imported. The major sources were, in declining order of importance, Libya, Iran, and Saudi Arabia.

The Government was hoping this situation would change with the discovery of the Agri oilfield in the Val d'Agri area of southern Italy by Agip S.p.A. in September 1997. The Agri field was believed to be the largest in the European continent with estimated reserves of 622 million barrels. So far, four producing wells have been developed. Agip was planing to invest about $1.4 billion in developing the field (Alexander's Gas and Oil Connections, October 27, 1997, Agip finds very large oilfield in South Italy, accessed April 21, 1998, at URL http://www gasandoil.com/goc /discover/dix74414.htm).

Public and private spending on environmental controls is expected to grow, particularly in the areas of water treatment, transportation equipment and services, disposal of urban and industrial waste, remediation of soil contamination, and control of emissions.

Mining of metallic ores is expected to remain at its reduced levels because of ore depletion. The metals-processing industry, based primarily on imported stocks, is expected to continue to play an important role in Italy's economy. Italy is expected to remain a large producer of crude steel and a significant producer of secondary aluminum and refined copper, lead, and zinc in the EU.

The industrial minerals quarrying industry and preparation plants are expected to remain significant, especially in the production of barite, cement, clays, fluorspar, marble, and talc. Italy is expected to continue to be the world's leading producer of feldspar, feldspathic minerals, and pumice. The ceramics sector is expected to be important, particularly regarding exports.

Domestic output of natural gas, crude petroleum, and petroleum refinery products is expected to grow, although Italy will continue to depend on imported coal, gas, and petroleum for most of its needs.

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Associazione Mineraria Italiana
Via delle Madonne, 20
00197 Rome, Italy
Ministero dell'Industria del Commercio e dell'Artigianato
Direzione Generale delle Minire
Via Molise, 2
00184 Rome, Italy

TABLE 1
ITALY: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
METALS						
Aluminum:						
Bauxite, gross weight		90,100	23,400	11,200	--	--
Alumina, calcined basis		549,100	556,928	857,000	881,000	850,000
Metal:						
Primary		155,700	175,631	197,750	184,377 r/	187,719 2/
Secondary		346,100	375,500	412,300	376,600 r/	442,900 2/
Antimony, oxides, gross weight 3/		942	900	757	800	800
Bismuth metal		15	5	5 e/	5	5
Cadmium metal, smelter		517	475	308	296 r/	287 2/
Copper, metal, refined, all kinds e/		90,300	84,000	98,000	85,800 r/ 2/	86,000
Iron and steel, metal:						
Pig iron	thousand tons	11,066	11,157	11,684	10,427	11,348 2/
Ferroalloys:						
Blast furnace, silicon pig iron e/		500	500	--	--	--
Electric furnace:						
Ferrochromium		53,504	22,650	51,017	29,915	11,295 2/
Ferromanganese		17,000	16,000	20,216	25,143	16,000
Ferrosilicon		3,350	--	--	11,741	12,000
Silicomanganese		50,000 e/	50,000 e/	103,961	100,353	100,000
Silicon metal		--	--	15,006	14,240	15,000
Other e/		12,000	10,000	10,000	10,000	10,000
Grand total e/		136,354	99,150	200,200	191,392	155,295
Steel, crude	thousand tons	25,701	26,114	27,766	23,922	25,537 2/
Semimanufactures	do.	21,760	22,775	22,000 e/	23,048	23,146 2/
Lead:						
Mine output, Pb content		7,404	13,902	15,142 r/	14,070 r/	11,792 2/
Metal, refined:						
Primary e/		89,900	91,700 r/	84,900	65,900 r/ 2/	65,700 2/
Secondary e/		92,900	114,200 r/	95,500	143,900 r/ 2/	145,900 2/
Total e/		182,800	205,900 r/	180,400	209,800 r/	211,600 2/
Manganese, mine output:						
Gross weight		8,198	8,200	6,548	5,829	6,000
Mn content		2,075	1,868	1,625	1,450	1,490
Silver metal	kilograms	9,340	12,080	13,900	9,100 r/ e/	10,000
Zinc:						
Mine output, Zn content e/		5,600	22,906	24,500	11,055 r/ 2/	8,470 2/
Metal, primary		253,600	255,900	259,600 r/ 2/	269,000 r/	268,300 2/
INDUSTRIAL MINERALS						
Barite		52,697	57,856	44,000	80,463	26,300 2/
Bromine e/		300	300	300	300	300
Cement, hydraulic	thousand tons	33,771 r/	32,713 r/	33,715 r/	33,327 r/	33,721 2/
Clays, crude:						
Bentonite	do.	327	386	591	475	513 2/
Refractory excluding kaolinitic earth	do.	434	619	730 e/	784	750
Fuller's earth	do.	20	24	34	26	30
Kaolin	do.	76	74	88	120	100
Kaolinitic earth	do.	15	7	10 e/	9	10
Diatomite e/		25,000	25,000	25,000	25,000	25,000
Feldspar	thousand tons	1,534	1,807	2,199	2,310	2,200
Fluorspar:						
Acid-grade		58,000	52,630	91,529	103,527	105,800 2/
Metallurgical-grade		25,000	15,312	33,140	23,000	20,000
Total		83,000	67,942	124,669	126,527	125,800

See footnotes at end of table.

TABLE 1--Continued
ITALY: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
INDUSTRIAL MINERALS--Continued						
Gypsum	thousand tons	1,200	1,361	2,362	2,000	2,000
Lime, hydrated, hydraulic and quicklime e/	do.	3,600	3,500	3,500	3,500	3,500
Nitrogen, N content of ammonia	do.	729	504	487 r/	397 r/	445 2/
Perlite e/		65,000	65,000	60,000	60,000	60,000
Pigments, mineral, iron oxides, natural e/		700	600	600	500	500
Potash, crude salts:						
Gross weight	thousand tons	200	--	--	--	--
K_2O equivalent	do.	24	--	--	--	--
Marketable product, K_2O equivalent	do.	20	--	--	--	--
Pumice and related materials: e/						
Pumice and pumiceous lapilli	do.	700	700	650	600	600
Pozzolan	do.	4,500	4,500	4,000	4,000	4,000
Pyrite, all types, gross weight	do.	377	258	--	--	--
Salt:						
Marine, crude e/ 4/	do.	580	600	600	600 r/ e/	600
Rock and brine	do.	3,150	3,353	2,952	2,941 r/	2,910 2/
Sand and gravel: e/						
Volcanic sand	do.	100	100	100	100	100
Silica sand	do.	3,100	2,700	3,000	2,950	3,000
Other sand and gravel		100,000	100,000	87,000	90,000	100,000
Sodium compounds: e/						
Soda ash	thousand tons	1,056	1,050	1,070	1,100	1,000
Sodium sulfate	do.	125	125	125	125	125
Stone: e/ 5/						
Calcareous:						
Alabaster	do.	20	25	25	25	25
Marble in blocks:						
White	do.	110	110	100	103	100
Colored	do.	2,900	3,000	3,000	3,000	3,000
Travertine	do.	1,000	1,000	2,000	2,610	2,500
Other:						
Granite	do.	1,000	1,000	1,000	67	100
Sandstone	do.	1,800	1,800	1,800	1,800	1,800
Slate	do.	120	120	120	107	100
Crushed and broken:						
Dolomite	do.	700	700	700	700	700
Limestone	do.	120,000	120,000	120,000	120,000	120,000
Marl for cement	do.	14,000	12,000	14,000	14,000	15,000
Serpentine	do.	1,500	1,500	1,400	1,662	1,500
Quartz and quartzite	do.	250	250	250	29	30
Sulfur, recovered as elemental and in compounds:						
S content of pyrite	do.	145	108	--	--	--
Byproduct, oil refining and other sources e/	do.	300	300	300	300	300
Total e/	do.	445	408	300	300	300
Talc and related materials		142,000	139,200	136,000	136,000 r/ e/	142,000
MINERAL FUELS AND RELATED MATERIALS						
Asphalt and bituminous rock, natural		38,000	36,000	31,620	29,646	30,000
Carbon black e/		130,000	130,000	--	--	--
Coal:						
Lignite	thousand tons	1,053	517	352	223	203
Subbituminous (Sulcis coal)		17,000	--	--	4,787	4,800
Coke, metallurgical e/	thousand tons	5,000	5,000	5,000	4,686 r/ 2/	5,214 2/
Gas, natural	million cubic meters	19,427	20,506	20,383	20,218	19,500
Natural gas liquids e/	thousand 42-gallon barrels	400	400	400	400	400

See footnotes at end of table.

TABLE 1--Continued

ITALY: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
MINERAL FUELS AND RELATED MATERIALS--Continued						
Petroleum:						
Crude	thousand 42-gallon barrels	31,462	33,212	35,466	36,994	36,720
Refinery products:						
Liquefied petroleum gas	do.	25,543	26,622	25,926	25,114	25,000
Gasoline	do.	161,823	160,251	160,000 e/	160,000	160,000
Naphtha e/	do.	16,000	16,000	16,000	16,000	16,000
Jet fuel	do.	22,206	23,007	24,000 e/	24,000	24,000
Kerosene	do.	34,038	34,929	35,000 e/	35,000	35,000
Distillate fuel oil	do.	218,000	220,000	220,000 e/	220,000	220,000
Residual fuel oil	do.	154,112	138,781	140,000 e/	140,000	140,000
Other e/	do.	35,000	35,000	35,000	35,000	35,000
Refinery fuel and losses e/	do.	39,000	38,000	38,000	38,000	38,000
Total e/	do.	705,722	692,590	693,926	693,114	693,000

e/ Estimated. r/ Revised.

1/ Table includes data available through June 1998.

2/ Reported figure.

3/ Antimony content is 83% of gross weight.

4/ Does not include production from Sardinia and Sicily estimated to be 200,000 metric tons per year.

5/ Output of limestone and serpentine for dimension stone is included with "Stone: Crushed and broken." In addition to the commodities listed, a variety of other dimension stone was produced and previously listed, but available general information was inadequate for continued reliable estimation of output levels.

TABLE 2
ITALY: 1996 BALANCE OF PAYMENTS, SELECTED MINERAL COMMODITIES in 1996 1/

(Thousand dollars)

Mineral commodity	Exports to EU	Imports from EU	Net gain or (loss)	Exports to the world	Imports from the world	Net gain or (loss)
Crude industrial minerals:						
Clays, kaolin	1,338	71,065	(69,727)	2,892	119,881	(116,989)
Feldspar	2,282	4,744	(2,462)	3,361	27,247	(23,886)
Fluorspar	1	2,103	(2,102)	174	12,791	(12,617)
Marble	43,076	34,614	8,462	187,419	74,391	113,028
Talc	13,055	14,462	(1,407)	17,272	18,610	(1,338)
Vermiculite, perlite, chlorite	1,173	857	316	1,414	4,057	(2,643)
Other	164,815	380,447	(215,632)	290,352	919,989	(629,637)
Total	225,740	508,292	(282,552)	502,884	1,176,966	(674,082)
Portland cement	42,277	63,161	(20,884)	98,393	81,436	16,957
Stone, building	806,920	23,559	783,361	2,017,328	47,104	1,970,224
Metals:						
Aluminum:						
Ore and concentrate	368	1,600	(1,232)	1,317	87,553	(86,236)
Oxides and hydroxides	2,236	84,173	(81,937)	83,267	109,921	(26,654)
Metal includiong alloys:						
Unwrought	51,487	549,893	(498,406)	64,174	865,960	(801,786)
Semimanufactures	771,571	853,411	(81,840)	1,200,900	1,084,603	116,297
Total	823,058	1,403,304	(580,246)	1,265,074	1,950,563	(685,489)
Copper:						
Ore and concentrate	1	20	(19)	14	62	(48)
Matte and speiss including cement copper	1,824	33	1,791	1,875	33	1,842
Metal includiong alloys:						
Scrap	60,328	323,296	(262,968)	63,085	381,733	(318,648)
Unwrought	34,892	335,109	(300,217)	48,331	1,188,499	(1,140,168)
Semimanufactures	642,459	925,406	(282,947)	845,249	1,000,011	(154,762)
Total	737,679	1,583,811	(846,132)	956,665	2,570,243	(1,613,578)
Iron and steel:						
Ore and concentrate	312	2,789	(2,477)	520	454,949	(454,429)
Metal excludiong scrap	4,476,529	5,704,439	(1,227,910)	7,638,440	7,863,729	(225,289)
Lead:						
Ore and concentrate	1,432	12,663	(11,231)	4,685	41,126	(36,441)
Oxides	799	1,751	(952)	6,169	1,803	4,366
Metal includiong alloys:						
Scrap	406	2,613	(2,207)	414	4,656	(4,242)
Unwrought	11,358	47,815	(36,457)	14,315	92,711	(78,396)
Semimanufactures	710	5,199	(4,489)	1,058	5,481	(4,423)
Total	12,474	55,627	(43,153)	15,787	102,848	(87,061)
Zinc:						
Ore and concentrate	119	21,188	(21,069)	659	131,779	(131,120)
Oxides	12,148	12,130	18	12,821	18,043	(5,222)
Blue powder	1,161	12,197	(11,036)	1,495	12,544	(11,049)
Metal includiong alloys:						
Scrap	1,151	14,786	(13,635)	7,247	16,072	(8,825)
Unwrought	70,820	92,752	(21,932)	88,531	142,108	(53,577)
Semimanufactures	2,756	12,514	(9,758)	1,351	12,748	(11,397)
Total	74,727	120,052	(45,325)	97,129	170,928	(73,799)
Other nonferrous metals	130,110	417,723	(287,613)	183,615	860,302	(676,687)
Total, metals	6,274,665	9,430,711	(3,156,046)	10,269,012	13,921,477	(3,652,465)
Mineral fuels	813,627	1,875,769	(1,062,142)	3,086,562	17,406,188	(14,319,626)

1/ Table prepared by Glenn J. Wallace.

TABLE 3
ITALY: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

			Destinations	
Commodity		Total	United States	Other (principal)
METALS				
Akali and akaline-earth metals:				
Alkali metals		818	1	Germany 163; France 130; unspecified countries 187.
Alkaline-earth metals		147	--	Thailand 28; Germany 20; Slovenia 17.
Aluminum:				
Ore and concentrate		17,528	--	France 11,354; Morocco 2,385; Hungary 2,357.
Oxides and hydroxides		410,798	241	Slovakia 305,965; Ukraine 33,000; Romania 27,000.
Metal including alloys:				
Scrap		11,800	4	Germany 5,322; France 2,872; Hungary 1,001.
Unwrought		39,362	(2/)	Germany 24,261; France 4,162; United Kingdom 2,235.
Semimanufactures		300,861	12,566	Germany 77,566; France 43,067; Spain 30,490.
Antimony, metal including alloys, all forms		10	--	Belgium-Luxembourg 6; Switzerland 2; Croatia 1.
Beryllium, metal including alloys, all forms	value, thousand	$132	--	Japan $82; Romania $29; Republic of Korea $8.
Bismuth, metal including alloys, all forms	do.	$43	--	Mexico $16; Pakistan $14; Germany $9.
Cadmium, metal including alloys, all forms		221	--	Belgium-Luxembourg 118; Netherlands 83; United Kingdom, 17.
Chromium:				
Ore and concentrate		2,330	--	Austria 426; Slovenia 355; France 346.
Metal including alloys, all forms		51	--	Australia 24; Syria 20; Egypt 6.
Cobalt, metal including alloys, all forms		76	--	United Kingdom 26; Belgium-Luxembourg 17; Denmark 7.
Columbium and tantalum:				
Ore and concentrate 3/		42	--	Sri Lanka 41; Pakistan 1.
Tantlum metal including alloys, all forms		11	7	Germany 2; Singapore 1.
Copper:				
Ore and concentrate		90	--	Unspecified countries.
Matte and speiss including cement copper		1,794	2	Belgium-Luxembourg 1,787; Switzerland 2; Australia 1.
Metal including alloys:				
Scrap		46,468	267	Germany 21,774; Austria 5,927; France 3,779.
Unwrought		19,017	68	United Kingdom 4,832; France 3,133; Spain 2,876.
Semimanufactures		220,125	2,103	Germany 48,255; France 37,097; Spain 36,262.
Germanium, metal including alloys, all forms	value, thousand	$1	--	All to Japan.
Gold:				
Waste and sweepings	do.	$167	--	Switzerland $144; Germany $17; France $4.
Metal including alloys, unwrought and partly wrought	kilograms	27,432	1,405	Austria 16,145; United Kingdom 3,312; Switzerland 2,485.
Iron and steel:				
Ore and concentrate:				
Excluding roasted pyrite		231	--	Ecuador 200; Spain 25; Greece 5.
Pyrite, roasted		18,957	--	France 14,806; Slovenia 4,012; Malta 44.
Metal:				
Scrap		20,012	7	France 7,577; Germany 3,094; Slovenia 2,709.
Pig iron, cast iron, related materials		23,725	756	Germany 4,907; Turkey 2,791; Belgium-Luxembourg 2,683.
Ferroalloys:				
Ferrochromium		2,005	--	Germany 851; Slovenia 640; France 208.
Ferromanganese		7,256	5,113	Canada 1,073; France 492; Hungary 200.
Ferronickel		2	--	All to India.
Ferrosilicochromium		7	--	France 6; Germany 1.
Ferrosilicomanganese		2,881	--	Austria 2,384; Croatia 352; Germany 60.
Ferrosilicon		7,956	3,891	Germany 1,647; France 1,610; Austria 200.
Silicon metal 4/		2,850	228	Germany 1,955; Japan 170; Austria 125.
Unspecified		733	--	Tunisia 248; Slovenia 168; Slovakia 72.
Steel, primary forms		656,996	43,528	India 104,926; Morocco 99,311; Republic of Korea 77,404.

See footnotes at end of table.

TABLE 3--Continued
ITALY: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

			Destinations	
Commodity		Total	United States	Other (principal)
METALS--Continued				
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	thousand tons	2,611	271	France 478; Spain 220; Turkey 193.
Clad, plated, coated		779,523	58,892	France 149,414; Turkey 65,443; Germany 63,360.
Of alloy steel		500,913	83,669	Germany 58,198; Spain 41,029, France 40,872.
Bars, rods, angles, shapes, sections	thousand tons	3,715	36	Germany 1,030; France 608; Greece 376.
Rails and accessories		27,189	61	Finland 14,276; Switzerland 4,182; Turkey 2,279.
Wire		321,578	7,505	France 84,335; Germany 41,385; Austria 38,252.
Tubes, pipes, fittings	thousand tons	2,204	74	Germany 474; France 356; Norway 209.
Lead:				
Ore and concentrate		11,856	--	Morocco 6,005; Yugoslavia 4,000; Austria 1,851.
Oxides		5,444	--	Poland 1,109; Thailand 1,020; Algeria 789.
Metal including alloys:				
Scrap		2,268	--	France 2,219; Belgium-Luxembourg 48; Malaysia 1.
Unwrought		15,894	--	Austria 6,031; Turkey 3,495; Netherlands 2,003.
Semimanufactures		745	(2/)	France 551; Turkey 35; Croatia 27.
Magnesium, metal including alloys:				
Scrap		388	22	Norway 250; Belgium-Luxembourg 35; Germany 34.
Unwrought		767	--	Belgium-Luxembourg 230; Germany 204, United Kingdom 184.
Semimanufactures		1,541	--	Belgium-Luxembourg 511; Netherlands 255; Germany 188.
Manganese:				
Ore and concentrate, metallurgical-grade		3,109	1,917	Canada 1,073; France 94; Spain 25.
Oxides and hydroxides		126	--	Yugoslavia 58; Croatia 16; Poland 12.
Metal including alloys, all forms		506	43	Germany 409; Sweden 20; Belgium-Luxembourg 11.
Mercury		58	--	Slovenia 33; Netherlands 15; Spain 5.
Molybdenum:				
Ore and concentrate:				
Roasted		31	--	All to United Kingdom.
Unroasted	value, thousand	$1	--	All to Belgium-Luxembourg.
Metal including alloys:				
Unwrought, including waste and scrap		16	(2/)	Portugal 5; United Kingdom 5; Germany 4.
Semimanufactures		16	1	Canada 8; Czech Republic 2; Germany 2.
Nickel:				
Matte and speiss		329	(2/)	Spain 328; Brazil 1.
Metal including alloys:				
Scrap		617	53	Germany 324; United Kingdom 154; Belgium-Luxembourg 52.
Unwrought		4,753	101	Ireland 2,463; United Kingdom 1,374; Belgium-Luxembourg 461.
Semimanufactures		4,602	52	France 3,545; Hong Kong 176; Spain 122.
Platinum-group metals:				
Waste and sweepings	value, thousand	$1,134	--	Netherlands $705; Switzerland $315; United Kingdom $115.
Metal including alloys, unwrought and partly wrought	do.	$26,537	$2,517	United Kingdom $12,553; Germany $2,805; Netherlands $1,388.
Silver, metal including alloys, unwrought and partly wrought	do.	$61,303	$399	Spain $19,564; Germany $13,322; United Kingdom $5,681.
Tin:				
Ore and concentrate		3	--	All to United Kingdom.
Metal including alloys:				
Scrap		164	--	United Arab Emirates 87; Belgium-Luxembourg 61; Germany 16.
Unwrought		2,594	1	Ireland 2,440; France 43; Switzerland 32.
Semimanufactures		232	(2/)	Czech Republic 49; Turkey 34; Egypt 28.

See footnotes at end of table.

TABLE 3--Continued

ITALY: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
METALS--Continued				
Titanium:				
Ore and concentrate		850	--	All to United Kingdom.
Oxides		15,915	30	Canada 8,038; Japan 3,551; United Kingdom 1,508.
Unwrought, including waste and scrap		1,497	1,344	United Kingdom 92; Germany 43; Belgium-Luxembourg 7.
Semimanufactures		3,037	121	Germany 406; United Kingdom 323; France 315.
Tungsten:				
Ore and concentrate	value, thousand	$3	--	France $2; Spain $1.
Metal including alloys:				
Unwrought, including waste and scrap		163	28	Germany 68; Netherlands 28; France 25.
Semimanufactures		27	(2/)	Canada 18; Hungary 5; Slovenia 1.
Zinc:				
Ore and concentrate		2,474	--	Bulgaria 2,040; Tunisia 273; Germany 89.
Oxides		12,808	--	Spain 5,612; Belgium-Luxembourg 2,949; France 1,863.
Metal including alloys:				
Scrap		8,773	(2/)	Hong Kong 2,999; France 1,179; Germany 466.
Unwrought		53,722	6,001	Nertherlands 12,310; Turkey 7,619; Austria 4,996.
Semimanufactures 5/		2,429	17	France 861; Germany 845; Slovenia 75.
Zirconium:				
Ore and concentrate		19,435	--	Turkey 6,976; Hungary 2,169; Hong Kong 1,260.
Metal including alloys:				
Unwrought, including waste and scrap		822	--	China 336; Thailand 120; Brazil 103.
Semimanufactures		604	(2/)	China 315; Mexico 84; Iran 70.
Other:				
Ores and concentrates		257	--	Turkey 252; Hong Kong 2; Germany 1.
Oxides and hydroxides		2,277	50	Germany 677; France 294; Belgium-Luxembourg 264.
Ashes and residues		71,984	52	Belgium-Luxembourg 23,073; Spain 15,189; Germany 13,876.
Base metals including alloys, all forms	value, thousand	$304	$22	United Kingdom $62; Germany $50; Algeria $49.
Metalloids 6/		16	--	France 5; Switzerland 5; Netherlands 4.
Precious metals, n.e.s.:				
Ores and concentrates	kilograms	8,176	--	Denmark 2,176; Spain 6,000.
Waste and sweepings	do.	7,271	--	United Kingdom 6,708; Germany 458; United Arab Emirates 60.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural, corundum, emery, pumice, etc.		50,594	902	Germany 21,683; United Kingdom 18,037; France 3,101.
Artificial corundum		23,191	1,668	Austria 5,410; Germany 4,204; France 3,581.
Dust and powder of precious and semiprecious stones including diamonds	value, thousand	$7,314	$160	Germany $4,403; Hong Kong $534; Ireland $372.
Grinding and polishing wheels and stones		42,811	583	France 3,710; Saudi Arabia 2,724; Spain 2,642.
Asbestos, crude		51	--	Austria 30; Albania 10; Spain 9.
Barite and witherite		1,082	--	Tunisia 270; Spain 211; Slovenia 180.
Boron, crude natural borates		8,840	--	France 8,308; Germany 290; Indonesia 79.
Bromine, fluorine, iodine		64	--	Germany 60; Switzerland 2; France 1.
Cement	thousand tons	1,651	230	Austria 300; Malta 221; Albania 176.
Chalk		7,912	--	Switzerland 7,583; Greece 157; Malta 48.
Clays, crude:				
Bentonite		172,627	12	Germany 52,579; France 44,858; Spain 33,309.
Kaolin		30,811	85	France 22,459; Austria 3,003; Tunisia 1,947.
Unspecified		18,857	--	Germany 5,613; India 2,828; Slovenia 1,914.
Cryolite and chiolite		7	--	All to Romania.
Diamond, natural:				
Gem, not set or strung	value, thousand	$8,240	$1,066	Belgium-Luxembourg $3,104; United Kingdom $2,562; Switzerland $330.

See footnotes at end of table.

TABLE 3--Continued
ITALY: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

			Destinations	
Commodity		Total	United States	Other (principal)
INDUSTRIAL MINERALS--Continued				
Diatomite and other infusorial earth		1,106	--	Switzerland 280; Egypt 158; Slovenia 93.
Feldspar		37,349	--	Germany 14,876; Spain 7,720; Switzerland 4,596.
Fertilizer materials:				
Crude, n.e.s.		35,252	2	France 18,943; Spain 4,970; United Arab Emirates 3,704.
Manufactured:				
Ammonia		551	--	Slovenia 322; France 47; Hungary 40.
Nitrogenous		361,914	119	Greece 65,018; Spain 50,990; Thailand 36,240.
Phosphatic		3,151	--	Spain 2,827; Croatia 196; Greece 48.
Potassic		1,170	--	Somalia 500; Tunisia 148; France 118.
Unspecified and mixed		28,158	54	France 5,726; Kenya 4,875; Spain 3,446.
Fluorspar		2,114	--	Malta 1,700; Switzerland 194; Turkey 130.
Graphite, natural		210	3	Spain 71; Germany 40; Poland 25.
Gypsum and plaster		89,799	1	Slovenia 43,385; Switzerland 24,918; Austria 14,166.
Lime		30,226	--	France 18,440; Switzerland 5,608; Slovenia 2,019.
Magnesium compounds:				
Magnesite, crude		4,836	126	Netherlands 1,065; Canada 271; Portugal 271.
Oxides and hydroxides		71,531	2,613	Germany 19,298; India 14,700; South Africa 11,225.
Mica:				
Crude including splittings and waste		158	--	Germany 103; Israel 20; Belgium-Luxembourg 12.
Worked including agglomerated splittings		377	--	Germany 165; Austria 80; France 74.
Nitrates, crude		135	--	Slovenia 66; Russia 32; Romania 16.
Phosphates, crude		1,644	(2/)	Slovenia 1,033; Croatia 504; Spain 74.
Pigments, mineral, iron oxides and hydroxides, processed		18,621	670	Germany 4,352; United Kingdom 2,861; France 1,796.
Potassium salts, crude		10	--	All to Tunisia.
Precious and semiprecious stones other than diamond:				
Natural	value, thousand	$9,444	$1,088	France $1,723; Switzerland $1,568; Netherlands $1,259.
Synthetic	do.	$4,311	$407	Switzerland $1,332; France $826; Spain $509.
Pyrite, unroasted		8,361	312	Germany 3,421; Australia 865; France 709.
Quartz crystal, piezoelectric	value, thousand	$624	--	France $826; Spain $509; United Kingdom $184.
Salt and brine		292,480	222	Austria 62,889; Greece 55,728; Netherlands 53,490.
Sodium compounds, n.e.s.:				
Soda ash, manufactured		16,993	18	Israel 10,613; Greece 4,203; Tunisia 627.
Sulfate, manufactured		4,736	--	Czech Republic 1,953; Slovenia 803; Greece 170.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked		809,676	17,361	Lebanon 153,357; Germany 70,539; Spain 61,213.
Worked	thousand tons	2,638	233	Germany 668; Saudi Arabia 220; Switzerland 105.
Dolomite, chiefly refractory-grade		64,291	235	France 39,637; Germany 6,706; Venezuela 5,509.
Gravel and crushed rock	thousand tons	1,171	1	Germany 217; Switzerland 209; Belgium-Luxembourg 150.
Limestone other than dimension		109	--	Japan 54; Egypt 37; Turkey 10.
Quartz and quartzite		15,061	1	France 6,472; Germany 1,895; Netherlands 1,645.
Sand other than metal-bearing		79,624	(2/)	Switzerland 63,317; France 3,783; Croatia 3,265.
Sulfur:				
Elemental:				
Crude including native and byproduct		64,883	--	United Kingdom 20,045; Croatia 15,963; Lebanon 13,945.
Colloidal, precipitated, sublimed		309	--	Croatia 226; Lebanon 40; Israel 15.
Dioxide		8,288	1	Austria 3,782; France 1,571; Australia 378.
Sulfuric acid		140,553	41	Lebanon 61,673; Spain 43,848; Greece 17,437.
Talc, steatite, soapstone, pyrophyllite		68,246	145	Germany 37,372; Austria 8,057; France 5,692.
Vermiculite, perlite, chlorite		40,957	--	United Kingdom 22,465; France 15,691; Greece 2,002.
Other:				
Crude		17,751	41	Spain 4,949; France 2,226; Malaysia 1,484.
Slag and dross, not metal-bearing	thousand tons	1,811	275	Israel 335; Greece 259; Croatia 239.

See footnotes at end of table.

TABLE 3--Continued

ITALY: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural		3,387	--	France 500; Germany 419; Switzerland 387.
Carbon black		63,943	6	Turkey 19,751; France 16,653; Germany 10,586.
Coal:				
Anthracite		2,416	--	France 1,246; Venezuela 525; Spain 394.
Bituminous		1,590	--	Lebanon 1,575; Malta 15.
Briquets of anthracite and bituminous coal		396	--	Germany 386; Bosnia and Herzegovina 5; Russia 3.
Unspecified		3,941	--	Croatia 2,164; Macedonia 500; Slovenia 374.
Coke and semicoke		88,806	--	France 39,426; Austria 9,131; Turkey 7,000.
Gas, natural:				
Gaseous		19,083	--	Switzerland 11,327; Slovenia 7,755.
Liquefied		23,264	--	Switzerland 23,222; Israel 23; Albania 20.
Peat including briquets and litter		1,731	--	Slovenia 805; Switzerland 742; Germany 55.
Petroleum:				
Crude		317,706	--	Germany 272,154; Spain 45,551; Albania 1.
Refinery products:				
Liquefied petroleum gas		181,897	14,411	Tunisia 58,871; Morocco 40,966; Lebanon 14,292.
Gasoline	thousand tons	3,393	221	Libya 661; Spain 364; Lebanon 312.
Mineral jelly and wax		17,042	99	Netherlands 6,358; Germany 5,409; Slovenia 2,250.
Kerosene and jet fuel		815,205	70,209	Tunisia 144,599; Malta 112,269; Spain 82,396.
Distillate fuel oil	thousand tons	7,137	1	Brazil 954; Spain 863; Switzerland 765.
Lubricants		781,611	20,646	United Kingdom 232,172; United Arab Emirates 68,848; Syria 60,969.
Residual fuel oil	do.	3,741	150	Romania 1,428; Malta 575; Tunisia 471.
Bitumen and other residues		191,844	--	Tunisia 43,046; Austria 36,393; Switzerland 26,555.
Bituminous mixtures		4,186	20	Poland 763; Ukraine 423; Croatia 375.
Petroleum coke		45,731	--	France 20,198; Slovenia 18,729; Greece 5,300.

1/ Table prepared by Glenn J. Wallace.

2/ Less than 1/2 unit.

3/ May include vanadium.

4/ May include high-purity silicon.

5/ Includes dust, flakes, and powders.

6/ Reported under SITC item number as "selenium, tellurium, phosphorus, arsenic, etc."

Source: United Nations Statistical Office (microfiche).

TABLE 4
ITALY: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Sources	
			United States	Other (principal)
METALS				
Akali and akaline-earth metals:				
Alkali metals		569	211	France 252; China 30; Hungary 25.
Alkaline-earth metals		403	(2/)	France 166; Netherlands 120; Ireland 50.
Aluminum:				
Ore and concentrate	thousand tons	2,079	(2/)	Australia 1,096; Guinea 906; China 51.
Oxides and hydroxides		310,370	1,375	France 89,689; Greece 62,504; Germany 60,694.
Metal including alloys:				
Scrap		266,187	405	Germany 117,755; France 47,635; Switzerland 38,684.
Unwrought		484,899	21	Netherlands 105,518; France 75,878; Germany 36,443.
Semimanufactures		352,790	6,538	Germany 112,827; United Kingdom 47,917; France 39,572.
Antimony, metal including alloys, all forms		686	19	Netherlands 416; Belgium-Luxembourg 120; Peru 60.
Beryllium, metal including alloys, all forms	value, thousand	$607	$450	Germany $156; United Kingdom $1.
Bismuth, metal including alloys, all forms		96	--	United Kingdom 74; Netherlands 17; Belgiium-Luxembourg 4.
Cadmium, metal including alloys, all forms		51	(2/)	Finland 26; United Kingdom 12; Belgium-Luxembourg 11.
Chromium:				
Ore and concentrate		123,272	--	South Africa 65,407; Albania 26,237; Turkey 12,620.
Oxides and hydroxides		3,219	40	Germany 1,274; United Kingdom 846; Poland 479.
Metal including alloys, all forms		419	1	Netherlands 128; France 100; United Kingdom 95.
Cobalt:				
Oxides and hydroxides		669	--	Finland 252; Belgium-Luxembourg 229; Netherlands 98.
Metal including alloys, all forms		682	11	Belgium-Luxembourg 213; France 137; Germany 89.
Columbium and tantalum, tantalum metal including alloys, all forms		7	2	Austria 2; Germany 2; France 1.
Copper:				
Ore and concentrate		13	(2/)	Austria 10; Democratic Republic of Congo 2.
Matte and speiss including cement copper		5	--	Mainly from the Netherlands.
Metal including alloys:				
Scrap		228,079	1,401	Germany 90,480; France 47,629; United Kingdom 19,163.
Unwrought		489,828	960	Chile 146,351; Kazakstan 43,032; Germany 41,955.
Semimanufactures		286,335	1,999	Germany 97,349; France 71,876; Spain 23,353.
Germanium, metal including alloys, all forms	value, thousand	$162	$43	Belgium-Luxembourg $58; France $51; United Kingdom $9.
Gold:				
Waste and sweepings	do.	$995	--	Switzerland $931; Spain $47; United Kingdom $16.
Metal including alloys, unwrought and partly wrought	kilograms	331,746	15,544	South Africa 129,776; Switzerland 121,707; Canada 16,327.
Iron and steel:				
Ore and concentrate:				
Excluding roasted pyrite	thousand tons	16,048	41	Brazil 8,104; Mauritania 3,070; Australia 1,274.
Pyrite, roasted		20	20	
Metal:				
Scrap	thousand tons	4,935	2	Germany 1,830; France 962; Austria 416.
Pig iron, cast iron, related materials	do.	1,472	1	Russia 678; Algeria 259; Ukraien 207.

See footnotes at end of table.

TABLE 4--Continued
ITALY: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Sources	
			United States	Other (principal)
METALS--Continued				
Iron and steel--Continued:				
Metal--Continued:				
Ferroalloys:				
Ferrochromium		184,552	9	South Africa 77,187; Zimbabwe 28,627; Finland 24.070.
Ferromanganese		55,184	196	South Africa 20,480; France 14,270; Norway 8,841.
Ferronickel		37,602	--	France 17,429; Greece 8,560; Netherlands 6,681.
Ferrosilicochromium		293	--	Mainly from Germany.
Ferrosilicomanganese		70,452	--	Norway 25,566; China 15,349; Spain 8,586.
Ferrosilicon		100,594	10	Norway 48,848; Slovakia 16,082; France 9,556.
Silicon metal 4/		19,889	45	France 7,070; Netherlands 2,616; Ukraine 1,923.
Unspecified		23,803	383	Germany 5,665; United Kingdom 4,237; France 3,842.
Steel, primary forms	thousand tons	1,155	91	Russia 307,740; Ukraine 172,212; Germany 169,746.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	do.	5,630	144	France 1,171; Germany 662; Belgium-Luxembourg 538.
Clad, plated, coated	do.	1,399	95	France 296; Belgium-Luxembourg 234; Germany 220.
Of alloy steel		861,112	641	Germany 189,646; France 164,598; Belgium-Luxembourg 132,587.
Bars, rods, angles, shapes, sections	thousand tons	1,297	1	Germany 285; France 265; United Kingdom 200.
Rails and accessories		26,130	66	Netherlands 6,399; France 6,040; Germany 3,625.
Wire		114,130	48	Belgium-Luxembourg 28,284; Russia 24,478; France 9,032.
Tubes, pipes, fittings		666,346	26,528	Germany 120,178; France 85,446; Russia 76,162.
Lead:				
Ore and concentrate		104,483	10,131	Canada 24,022; Spain 17,315; Ireland 16,393.
Oxides		858	2	Netherlands 319; United Kingdom 245; Germany 146.
Metal including alloys:				
Scrap		8,449	--	United Kingdom 2,231; Tunisia 2,074; Switzerland 1,383.
Unwrought		104,126	100	France 20,581; Bulgaria 16,490; Peru 14,717.
Semimanufactures		4,623	(2/)	Belgium-Luxembourg 2,698; Germany 630; France 630.
Magnesium, metal including alloys:				
Scrap		390	(2/)	Germany 321; Croatia 31; Austria 24.
Unwrought		6,975	(2/)	Netherlands 1,723; Yugoslavia 1,375; Germany 893.
Semimanufactures		893	3	France 470; Netherlands 194; Spain 97.
Manganese:				
Ore and concentrate, metallurgical-grade		201,200	--	Gabon 139,541; South Africa 33,862; France 16,000.
Oxides and hydroxides		2,065	72	Belgium-Luxembourg 883; Germany 356; India 336.
Metal including alloys, all forms		3,445	16	China 1,192; Germany 604; Netherlands 571.
Mercury		19	--	Spain 10; Portugal 6; France 1.

See footnotes at end of table.

TABLE 4--Continued
ITALY: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Sources	
			United States	Other (principal)
METALS--Continued				
Molybdenum:				
Ore and concentrate:				
Roasted		2,849	753	Chile 741; Belgium-Luxembourg 722; United Kingdom 367.
Unroasted		15	--	Peru 11; Germany 3; United Kingdom 1.
Metal including alloys:				
Unwrought, including waste and scrap		232	1	Belgium-Luxembourg 184; Russia 19; United Kingdom.
Semimanufactures		68	3	Austria 51; United Kingdom 6; Germany 5.
Nickel:				
Ore and concentrate		22	--	All from the Netherlands.
Matte and speiss		3,022	--	Netherlands 1,494; Cuba 1,461; Russia 60.
Metal including alloys:				
Scrap		70	2	Azerbaijan 35; United Arab Emirates 16; Germany 6.
Unwrought		32,089	86	Russia 9,498; Netherlands 3,720; United Kingdom 2,965.
Semimanufactures		4,251	638	Germany 1,306; United Kingdom 1,045; France 504.
Platinum-group metals:				
Waste and sweepings	value, thousand	$4,229	--	United Kingdom $1,949; France $1,660; Netherlands $620.
Platinum metal including alloys, unwrought and partly wrought	do.	$207,156	$10,915	Russia $109,590; United Kingdom $39,950; Switzerland $14,917.
Silver:				
Ore and concentrate	do.	$7	--	All from Belgium-Luxembourg.
Metal including alloys, unwrought and partly wrought	do.	$152,360	$2,854	Germany $62,580; Switzerland $40,164; unspecified countries $12,943.
Tin:				
Ore and concentrate		39,875	4	France 23,827; Germany 5,806; Austria 2,815.
Metal including alloys:				
Scrap		120	--	Germany 118; Netherlands 2.
Unwrought		6,576	--	Malayasia 1,677; Ireland 1,472; Belgium-Luxembourg 1,186.
Semimanufactures		1,373	5	France 624; Germany 380; United Kingdom 186.
Titanium:				
Ore and concentrate		4,689	--	South Africa 3,540; Ukraine 750; Netherlands 128.
Oxides		22,270	95	Saudi Arabia 4,981; Australia 3,241; Slovenia 3,044.
Metal including alloys:				
Unwrought, including waste and scrap		4,005	904	Russia 1,718; Germany 507; Canada 309.
Semimanufactures		1,840	309	Russia 362; Germany 289; United Kingdom 171.
Tungsten:				
Ore and concentrate		152	--	All from Germany.
Metal including alloys:				
Unwrought, including waste and scrap		78	10	France 26; China 19; Israel 9.
Semimanufactures		57	15	Germany 23; Austria 5; France 5.
Uranium and thorium, metal including all forms:				
Uranium	value, thousand	$2	--	All from Austria.
Thorium	do.	$1	$1	
Vanadium, metal including alloys, all forms		20	--	Mainly from Germany.

See footnotes at end of table.

TABLE 4--Continued

ITALY: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Sources	
			United States	Other (principal)
METALS--Continued				
Zinc:				
Ore and concentrate		518,844	18,183	Canada 95,769; Australia 78,322; Peru 52,549.
Oxides		17,241	39	United Kingdom 2,285; France 2,260; Netherlands 2,006.
Metal including alloys:				
Scrap		21,825	--	Germany 10,221; France 8,073; Switzerland 1,199.
Unwrought		129,374	--	Belgium-Luxembourg 23,117; Poland 22,240; France 16,704.
Semimanufactures 5/		15,825	57	Germany 4,402; France 3,550; Netherlands 3,312.
Zirconium:				
Ore and concentrate		115,945	349	Australia 59,750; South Africa 45,077; Ukranie 3,720.
Metal including alloys:				
Unwrought, including waste and scrap		223	25	United Kingdom 82; Belgium-Luxembourg 44; Germany 38.
Semimanufactures		6	1	Belgium-Luxembourg 1; Germany 1; Israel 1.
Other:				
Ores and concentrates		124,334	--	South Africa 65,407; Albania 26,237; Turkey 12,820.
Oxides and hydroxides		7,672	416	France 2,196; Germany 1,711; United Kingdom 907.
Ashes and residues		165,515	19	Canada 125,078; France 15,144; Germany 6,344.
Base metals including alloys, all forms		30	13	Germany 9; France 5; Belgium-Luxembourg 1.
Metalloids 6/		3,264	(2/)	China 2,141; Kazakstan 348; Austria 292.
Precious metals, n.e.s.:				
Ores and concentrates	kilograms	4,700	--	All from Germany.
Waste and sweepings	do.	418,013	61,270	Switzerland 159,759; Canada 64,043; Hong Kong 31,588.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural corundum, emery, pumice, etc.		29,001	49	Turkey 16,013; Greece 8,960; China 1,603.
Artificial corundum		31,030	178	Ukraine 6,708; Austria 6,301; France 3,774.
Dust and powder of precious and semiprecious stones including diamonds	value, thousand	$72,932	$4,574	Switzerland $45,115; Germany $11,109; Belgium-Luxembourg $5,892.
Grinding and polishing wheels and stones		7,451	38	Germany 1,256; Austria 1,230; Czech Republic 1,136.
Asbestos, crude		127	--	All from France.
Barite and witherite		67,046	--	Bulgaria 31,570; Turkey 18,992; Spain 4,999
Boron:				
Crude natural borates		104,377	859	Turkey 102,173; Spain 1,227; Belgium-Luxembourg 43.
Oxides and acids		8,623	9	Turkey 2,854; Spain 2,694; Chile 1,226.
Bromine, fluorine, iodine		1,408	51	Japan 562; Netherlands 293; Chile 291.
Cement	thousand tons	1,304	(2/)	Greece 672; France 204; Croatia 199.
Chalk		5,273	19	France 2,196; Germany 1,711; United Kingdom 907.
Clays, crude:				
Bentonite		57,941	137	Greece 21,453; Morocco 12,600; Turkey 6,568.
Kaolin		868,006	142,933	United Kingdom 243,370; Germany 245,640; Bulgaria 86,692.
Unspecified	thousand tons	2,433	9	Germany 1,350; Ukraine 500; France 348.

See footnotes at end of table.

TABLE 4--Continued

ITALY: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

			Sources	
Commodity		Total	United States	Other (principal)
INDUSTRIAL MINERALS--Continued				
Cryolite and chiolite		501	--	Egypt 500; Netherlands 1.
Diamond, natural:				
Gem, not set or strung	value, thousand	$256,893	$5,070	Belgium-Luxembourg $150,482; Switzerland $36,166; Israel $3,119.
Industrial stones	do.	$5,141	$6	Belgium-Luxembourg $4,271; Germany $243; United Kingdom $233.
Diatomite and other infusorial earth		7,244	505	France 5,537; Spain 550; Germany 316.
Feldspar		602,980	2,048	Turkey 491,040; Canada 39,720; Greece 27,788.
Fertilizer materials:				
Crude, n.e.s.		27,170	11	France 10,783; Spain 9,242; Germany 1,989.
Manufactured:				
Ammonia		342,561	25	Russia 115,603; Ukraine 75,689; Algeria 36,199.
Nitrogenous		992,049	270	Germany 175,571; Bulgaria 134,758; Romania 114,399.
Phosphatic		271,183	--	Tunisia 67,805; Morocco 58,638; Lebanon 47,307.
Potassic		519,879	27,640	Israel 134,743; Germany 109,539; Jordan 90,390.
Unspecified and mixed	thousand tons	1,226	5	Tunisia 299; Morocco 164; Belgium-Luxembourg 141.
Fluorspar		95,823	--	China 36,910; Mexico 27,546; Kenya 14,928.
Graphite, natural		10,029	330	China 3,028; Germany 1,748; Austria 1,528.
Gypsum and plaster		24,628	2,784	Germany 10,753; France 8,834; United Kingdom 1,237.
Lime		18,111	--	Slovenia 11,198; United Kingdom 3,023; France 1,643.
Magnesium compounds:				
Magnesite, crude		27,136	9	Greece 12,870; Turkey 8,759; China 3,699.
Oxides and hydroxides		103,752	369	China 22,365; Greece 21,320; Austria 16,563.
Mica:				
Crude including splittings and waste		2,201	127	Austria 586; France 431; United Kingdom 390.
Worked including agglomerated splittings		957	30	Slovenia 230; Belgium-Luxembourg 218; China 124.
Nitrates, crude		4,724	--	Chile 3,564; Germany 572; Belgium-Luxembourg 468.
Phosphates, crude		231,733	--	Morocco 184,825; Syria 40,440; Israel 5,921.
Pigments, mineral, iron oxides and hydroxides, processed		26,695	204	Germany 11,366; Slovakia 5,234; France 3,663.
Potassium salts, crude		265	--	Canada 139; France 120; Germany 6.
Precious and semiprecious stones other than diamond:				
Natural	value, thousand	$40,854	$1,229	Thailand $11,271; Germany $8,921; India $4,762.
Synthetic	do.	$7,316	$681	Germany $2,779; Thailand $1,082; Philippines $975.
Pyrite, unroasted		12,003	--	Austria 5,846; Russia 5,837; Germany 209.
Quartz crystal, piezoelectric	value, thousand	$535	$89	Germany $206; Japan $124; France $41.
Salt and brine		648,456	47	France 336,555; Spain 89,363; Germany 84,917.
Sodium compounds, n.e.s.:				
Soda ash, manufactured		159,410	--	Bulgaria 99,461; Spain 28,870; Austria 12,617.
Sulfate, manufactured		146,733	13	Spain 90,424; Austria 31,599; France 7,933.

See footnotes at end of table.

TABLE 4--Continued
ITALY: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Sources	
			United States	Other (principal)
INDUSTRIAL MINERALS--Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	thousand tons	1,837	50	Brazil 332; Spain 229; South Africa 210.
Worked		117,050	268	Argentina 28,905; Portugal 16,377; Spain 15,359.
Dolomite, chiefly refractory-grade		3,681	--	Germany 2,182; Netherlands 867; Austria 277.
Gravel and crushed rock		853,931	9	Croatia 744,402; France 80,343; Ukraine 7,400.
Limestone other than dimension		93,056	--	Croatia 51,386; Slovenia 37,455; Germany 4,196.
Quartz and quartzite		110,043	110	Spain 50,012; Switzerland 36,732; Germany 9,926.
Sand other than metal-bearing	thousand tons	1,373	2	France 707,066; Spain 164,157; Egypt 149,449.
Sulfur:				
Elemental:				
Crude including native and byproduct		191,228	--	Poland 75,510; Germany 28,541; France 23,218.
Colloidal, precipitated, sublimed		915	11	United Kingdom 840; Germany 42; Albania 18.
Dioxide		88	--	Poland 72; Greece 16.
Sulfuric acid		51,708	53	Spain 26,686; Switzerland 6,892; Slovenia 6,475.
Talc, steatite, soapstone, pyrophyllite		85,744	92	China 29,583; France 26,158; Austria 14,615.
Vermiculite, perlite, chlorite		64,850	--	Turkey 45,290; Greece 11,027; South Africa 7,805.
Other:				
Crude		163,085	1,385	Spain 79,983; Australia 19,467; China 17,687.
Slag and dross, not metal-bearing		39,875	4	France 23,827; Austria 2,815; Spain 2,050.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural		698	498	Germany 94; Austria 76; France 28.
Carbon black		48,779	1,837	Croatia 10,678; France 9,370; Russia 6,027.
Coal:				
Anthracite		391,852	86,531	Russia 103,094; South Africa 92,403; China 60,500.
Bituminous	thousand tons	13,239	6,041	South Africa 2,711; Australia 2,407; Canada 1,206.
Briquets of anthracite and bituminous coal		3,192	--	France 2,812; Germany 351; Belgium-Luxembourg 12.
Lignite including briquets		16,251	173	Germany 15,194; Spain 864; United Kingdom 20.
Unspecified	thousand tons	3,093	2,022	South Africa 332; Colombia 197; Russia 180.
Coke and semicoke		551,769	5	China 297,151; Romania 83,805; France 57,032.
Gas, natural: Liquefied		109	--	All from Germany.
Peat including briquets and litter		399,808	857	Germany 228,219; Netherlands 55,108; Lithuania 5,708.
Petroleum:				
Crude	thousand tons	74,542	--	Libya 24,302; Iran 11,965; Saudi Arabia 9,894.
Refinery products:				
Liquefied petroleum gas	do.	1,806	(2/)	Algeria 873; Saudi Arabia 246; France 243.
Gasoline	do.	3,289	9	Libya 793; France 728; Belgium-Luxembourg 438.
Mineral jelly and wax		45,662	1,810	Belgium-Luxembourg 10,322; France 6,440; Germany 5,741.
Kerosene and jet fuel		43,781	33	France 19,937; Bahrain 14,914; Belgium-Luxembourg 4,047.

See footnotes at end of table.

TABLE 4--Continued
ITALY: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Sources	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS--Continued				
Petroleum--Continued:				
Refinery products--Continued:				
Distillate fuel oil	thousand tons	1,814	22	Russia 936; Algeria 430; Germany 93.
Lubricants		134,888	8,067	France 27,895; Belgium-Luxembourg 23,605; Germany 20,988.
Residual fuel oil	thousand tons	25,104	78	United Kingdom 5,288; Libya 3,004; Russia 2,916.
Bitumen and other residues		206,907	126,067	Spain 62,281; France 17,366; Germany 593.
Bituminous mixtures		2,778	41	France 758; Austria 712; United Kingdom 584.
Petroleum coke	thousand tons	2,352	1,799	Venezuela 228; Aruba 101; Argentina 42.

1/ Table prepared by Glenn J. Wallace.
2/ Less than 1/2 unit.
3/ May include vanadium.
4/ May include high-purity silicon.
5/ Includes dust, flakes, and powders.
6/ Reported under SITC item number as "selenium, tellurium, phosphorus, arsenic, etc."

Source: United Nations Statistical Office (microfiche).

TABLE 5
ITALY: STRUCTURE OF THE MINERAL INDUSTRY IN 1997
(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Alumina	Eurallumina S.p.A. (Comalco Ltd., 56.2%, Glencore AG, 43.8%)	Plant at Porto Vesme, Sardinia	950
Aluminum	Alcoa Italia S.p.A. (Aluminium Company of America, 100%)	Smelters at Porto Vesme, Sardinia, and Fusina, near Venice	188
Asbestos	Amiantifera di Balangero S.p.A.	Mine at Balangero, near Turin	100
Barite	Bariosarda S.p.A (Ente Mineraria Sarda)	Mines at Barega and Mont 'Ega, Sardinia	100
Do.	Edem S.p.A. (Government)	Mines at Val di Castello, Lucca	20
Do.	Edemsarda S.p.A. (Soc. Imprese Industriali)	Mines at Su Benatzu, Sto Stefano, and Peppixeddu, Sardinia	20
Do.	Mineraria Baritina S.p.A	Mines at Marigolek, Monte Elto, and Primaluna, near Milan	20
Bauxite	Sardabauxiti S.p.A. (Government)	Mine at Olmedo, Sardinia	350
Cement	52 companies, of which the largest are:		
Do.	Italcement-Fabbriche Riunite Cemento S.p.A.	19 plants, of which the largest are Calusco, Monselice, and Collefero	(6,003)
Do.	Cementerie del Tirreno S.p.A (Cementir)	Plants at Arquasta Scivia, Livorno, Maddaloni, Napoli, Spoleto, and Taranto	(6,250)
Do.	Unicem S.p.A.	Plants at Guidonia, Lugagnano, Morano, Piacenza, S'Arcangelo di Romagna, and Settimello	(4,630)
Copper, refined	Enirisorse (Government)	Refineries at Porto Marghera, near Venice, and Pieve Vergonte	46
Do.	Europa Metalli - LMI S.p.A.	Refineries at Campo Tizzoro, Fornaci di Barga, and Villa Carcina	26
Do.	Chimet S.p.A.	Refinery at Arezzo	13
Feldspar	At least 5 companies, of which the largest are:		1,500
Do.	Maffei S.p.A.	Surface mines at Pinzolo, Sondalo, and Campiglia Marittima; underground mine at Vipiteno	(200) (300)
Do.	Miniera di Fragne S.p.A.	Surface mine at Alagna Valsesia	(60)
Do.	Sabbie Silicee Fossanova S.P.A. (Sasifo)	Surface mine at Fossanova	(30)
Gold	Gold Mines of Sardinia 70%, Government 30%	Furtei Mine near Cagliaria, Sardinia	1,400 1/
Lead-zinc, ore	Enirisorse S.p.A.(Government)	Mines at Masua, Monteponi, and Sardinia	60
Lead, metal	do.	Refinery at San Gavino, Sardinia	80
		Kivcet smelter and Imperial smelter at Porto Vesme, Sardinia	114
Lignite	Ente Nazional per L'Energia Electtrica (ENEL)	Surface mines at Pietrafitta and Santa Barbara	1,500
Magnesium, metal	Societa Italiana Magnesio S.p.A. (INDEL)	Plant at Bolzano	8
Marble	A number of companies including:	Quarries mostly at Carrara and Massa	2,000
	Mineraria Marittima Srl	Quarries in the Carrara and Massa areas	(500)
	Industria dei Marmi Vicentini S.p.A.	Quarries in the Carrara area	(300)
	Figaia S.p.A.	do.	(100)
Petroleum, crude	Ente Nazional/Idrocarburi (ENI) (Government)	Oilfields: offshore Sicily, the Adriatic Sea, and onshore in Po River Valley	90
Petroleum, refined	do.	About 30 refineries	2,000 2/
Potash ore	Industria Sali Otassici e Affini per Aziono S.p.A.	Underground mines at Corvillo, Pasquasia, Racalmuto, and San Cataldo, in Sicily	1,300
Do.	Sta Italiana Sali Alcalini S.p.A. (Italkali)	Underground mines at Casteltermini and Pasquasia, Sicily	700
Pumice	Pumex S.p.A.	Quarries, Lipari Island, north of Sicily	600
Do.	Sta Siciliana per l'Industria ed il Commercio della Pomice di Lipari S.p.A. (Italpomice S.p.A.)	do.	200
Pyrite	Nuova Solmine S.p.A.	Underground mines at Campiano and Niccioleta	900
Salt, rock	Sta Italiana Sali Alcalini S.p.A. (Italkahi)	Underground mines at Petralia, Racalmuto, and Realmonte, Sicily	4,000
Do.	Solvay S.p.A.	Underground mines at Buriano, Pontteginori, and Querceto, Tuscany	2,000
Steel	Ilva Laminati Piani S.p.A. (Riva Group)	5 steel plants, the largest of which is Taranto (1,300 capacity)	4,000
Do.	Riva S.p.A	About 5 plants	7,000
Do.	AFV Beltrame S.p.A.	Steel plant at Vicenza	700
Talc	Talco e Grafite Val Chisone S.p.A.	Mines at Pinerolo, near Turin, and at Orani, Sardinia	120
Do.	Industria Mineraria Italiana S.p.A.	Mines at Largone and Predaccia	20
Do.	Talco Sarda S.p.A.	Mine at Orani, Sardinia	20
Zinc, metal	Enirisorse S.p.A. (Government)	Plants at Crotone and Porto Vesme, Sardinia, and Porto Maghera, near Venice	349

1/ Kilograms

2/ Thousand 42-gallon barrels per day.

THE MINERAL INDUSTRY OF

KAZAKHSTAN

By Richard M. Levine

Kazakhstan is the second largest country in land area after Russia to form from the republics of the former Soviet Union (FSU). It is endowed with large reserves of a wide range of minerals. Kazakhstan was a major producer of a large number of metals, including beryllium, bismuth, cadmium, chromite, copper, ferroalloys, lead, magnesium, rhenium, titanium, uranium, and zinc. It had significant production of a number of other mineral products, including arsenic, barite, coal, gold, molybdenum, natural gas, oil, phosphate rock, and tungsten. Kazakhstan has commercial reserves of 3 ferrous metals, 29 nonferrous metals, 2 precious metals, and 84 types of industrial minerals, as well as coal, natural gas, and petroleum (Zharkenov, 1997).

During the initial post-Soviet period, the mineral industry in Kazakhstan had been characterized by falling output, increasing unemployment, stoppages at many enterprises, lowering of investment levels, and reduced demand for the industry's output domestically and on export markets where products had difficulty competing (Zharkenov, 1997).

Because the mineral industry was badly in need of investment and restructuring, a large number of enterprises were put under foreign management through concessionaire contracts in 1995-96. A large percentage of mining and metallurgical enterprises came under the control of foreign managers who, in exchange for a share of the profits, as well as potential ownership rights to stock, invested in modernizing enterprises, increasing output and exports, decreasing costs, and upgrading technology to meet environmental standards (Zharkenov, 1997).

Subsequent to the awarding of management contracts, the mineral industry entered a period of stabilization and growth (Danayev, 1997). In 1997, Kazakhstan's economy experienced a 2% increase in gross domestic product and a 4% increase in industrial output compared with those of 1996 (Interfax Statistical Report, 1998a). Mineral production accounted for more than 50% of the country's industrial output—oil and gas production accounted for about 24%, ferrous metals production almost 14%, and nonferrous metals production about 12% (Uzhkenov, 1997).

Exports to world markets increased by almost 30% in value in 1997 compared with those of 1996. According to reported trade data for a limited number of mineral commodities, exports of copper anodes, ferroalloys, iron ore and concentrates, primary lead, and crude oil increased, and exports of fertilizers and refinery products decreased (Interfax Statistical Report, 1998b).

During the Soviet period, Kazakhstan underwent extensive development of the metals mining and metallurgical industries. With the dissolution of the Soviet Union, however, the country lost almost all its former base of consumers. Intensive mining resulted in the depletion of many deposits that are now left with low grades of ore at great depths. At the polymetallic deposits in the Rudnyy Altay, the Ertis (Irtysh), the Leninogorsk, and the Zyryanovsk regions, ore was being mined with a combined grade for copper, lead, and zinc of less than 3% from underground mines at deep levels. The lack of funds to conduct exploration since the breakup of the Soviet Union has greatly exacerbated this problem. Replenishing the reserve base with high-grade ores was considered one of the highest priorities for the minerals production sector. Also, the industry was in need of restructuring to make it cost competitive for operating under market economy conditions. This included installing state-of-the-art equipment and eliminating inefficient linkages to processing facilities that are often located hundreds, if not thousands, of kilometers from the mines (Danayev, 1997).

One of the major ways to reform the mineral industry will be to revise the laws dealing with investment and taxation to attract more foreign investment. Investment is needed for exploring and developing new deposits and introducing state-of-the-art processing technology to extract maximum value from ores and wastes (Zharkenov, 1997).

Kazakhstan has significant oil and gas reserves. The oil and gas industry, which was one of Kazakhstan's most attractive areas for foreign investment, was export-oriented. Since 1993, more than 40% of total foreign investment in Kazakhstan has gone into the oil and gas industry (Kazkommerts Securities, January 1998, Kazakhstan economic research, accessed May 15, 1999, at URL http://www.kazecon.kz/Kazkom/NewGuide/engl/page_4.htm). The Caspian Pipeline Consortium (CPC) project was expected to increase Kazakhstan's oil exports by around 80% (about US$1 billion in terms of export proceeds) by 2000 and a further 40% (an additional US$1 billion) by 2001 (Almaty Herald, December 3-9, 1998, Kazakhstan recovers from contagion, accessed on May 16, 1999 at URL http://www.kazecon.kz/English/ABN_kazakh.HTM).

Coal was Kazakhstan's major source of domestic fuel. Up to 80% of the energy sector's fuel demand was met by coal. The country produced sufficient amounts of coal for domestic use and exported coal to other Commonwealth of Independent States (CIS) countries. There was a trend in the development of Kazakhstan's coal industry for industrial enterprise interested in obtaining an uninterrupted supply of energy to purchase some coal mines and electric powerplants (Kazkommerts Securities, January 1998, Kazakhstan economic research, accessed May 15, 1999, at URL http://www.kazecon.kz/Kazkom/NewGuide/engl/page_4.htm).

Environmental Conditions

Kazakhstan occupies a territory of more than 2.7 million square kilometers in the center of Eurasia. Many varieties of landscapes from dry subtropics and hot deserts to high mountainous tundra and glaciers, as well as continental seas and lakes, such as the Caspian, Aral, Balqash (Balkhash), Zaysan, and Alakol' can be found. Kazakhstan's wealth of mineral resources spurred rapid development of mining and mineral-processing industries. Furthermore, the country's territory was the site of military bases, the Baykonur cosmodrome, and testing grounds for weapons, including nuclear weapons. All these resulted in intensive air, water, and soil pollution and natural resource depletion. Changes in the environment caused a sharp rise in population morbidity rates and mortality, serious destruction of ecosystems, desertification, and significant loss of biodiversity. In some regions, life expectancy was 15 to 20 years less than that in developed countries (Ministry of Environment and Natural Resources of the Republic of Kazakhstan, National environmental action plan for sustainable development of the Republic of Kazakhstan, accessed on May 4, 1999, at URL http://www.zoo.co.uk/~z80000142/links.html). Radioactive fallout from weapons testing traced by radioactive clouds has spread over a territory of 304,000 km^2 inhabited by about 1.5 million people.

Also, during the Soviet period, more than 40% of uranium output was produced in the territory of Kazakhstan. Extracting and processing uranium ores generated radioactive waste. The disposal and use of radioactive waste remain pressing issues. In February 1997, the leaders of five Central Asian states signed the Almaty Declaration, announcing 1998 to be the Year of Environmental Protection in the Central Asian region under the auspices of the United Nations and the development of a complex program for environmental protection. It challenged all interested countries to support the initiative of declaring Central Asia a nonnuclear zone on the eve of the 50th anniversary of the establishment of the Semipalatinsk nuclear weapons test site.

Commodity Review

Aluminum

Reserves.—The country's bauxite reserves are in sedimentary karst-type deposits. The largest deposits were the Belinskoye, the Koktal'skoye, the Krasnooktyabrskoye, the Tuansorskoye, and the Vostochno-Ayatskoye, which composed 76% of the country's reserves (Uzhkenov, 1997). The country's economic reserves were reported to be about 355 million metric tons (Mt). Bauxite ore averaged about 44% alumina (Kruse and Parchmann, 1998, p. 62).

Production status.—Kazakhstan produced alumina at the Pavlodar aluminum plant. Local ores supplied the plant, which, despite its name, produced only alumina. The country ranked as a significant world alumina producer with more than 1 million metric tons per year (Mt/yr) of production. The Pavlodar plant was also a large producer of byproduct gallium. Most alumina production was shipped to aluminum smelters in Russia (USAID Kazakhstan Securities Market Development Project, July 18, 1997, JSC alumina Kazakhstan, accessed May 4, 1999, at URL http://www.kazecon.kz/Memos/Eng/ALUM.htm).

Production development.—Bauxite reserves were considered to be adequate for more than 90 years at the current level of output and for more than 60 years at projected levels of development. Plans called for the construction of a primary aluminum plant, which has been on the drawing board for decades. Problems in developing aluminum production included ensuring an adequate energy supply and environmental issues involving the siting of the plant (Interfax Mining and Metallurgical Report, 1999a).

Ownership status.—Aluminum Kazakhstan, the joint stock company (JSC) created by a Government resolution in 1996, included the Pavlodar aluminum plant and the Krasnooktyabr (Red October) and Turgay bauxite mining companies. As of 1994, Aluminum Kazakhstan had been under the management of Whiteswan Ltd. (registered in the British Virgin Islands). Whiteswan was a joint venture of the Trans World Group of the United Kingdom and Kazakhstan Mineral Resources (KMR), a Kazakhstan-based financial group. Whiteswan purchased controlling shares of the aluminum plant and the two bauxite mining companies. Whiteswan also purchased the Pavlodar No. 1 heating and power plant (USAID Kazakhstan Securities Market Development Project, July 18, 1997, JSC alumina Kazakhstan, accessed May 4, 1999, at URL http://www.kazecon.kz Memos/Eng/ALUM.htm).

Barite

Reserves.—Kazakhstan's barite reserves of 162 Mt of $BaSO_4$ compose more than 30% of the world's reserves (Kruse and Parchmann, 1998, p. 85). Three deposits, the Ansay, the Bestube, and the Zhayrem accounted for more than 70% of reserves in categories A, B, and C1, in the reserve classification system that was used in the Soviet Union (Daukeev, 1995, p. 11).

Production status.—Kazakhstan produced more than 75% of the FSU's barite output. Barite was produced by companies mining primarily polymetallic and lead-zinc deposits, although some barite was produced at 2 barite deposits in southern Kazakhstan and 11 sulfide deposits in the central, eastern, and southeastern parts of the country (Daukeev, 1995, p. 116; Kruse and Parchmann, 1998, p. 85). The Kargayly and the Zhayrem deposits accounted for more than 70% of total output. Barite concentrate was produced by flotation at nonferrous metallurgical enterprises and was of low quality owing to the presence of flotation reagents (Daukeev, 1995, p. 116). The main consumers for Kazakhstan's barite were oil-drilling and exploration enterprises in Kazakhstan and Uzbekistan (Kruse and Parchmann, 1998, p. 85).

Production development.—With the expansion of oil production, local barite resources will be of increasing importance However, many oil industry enterprises have refused to use Kazakhstan's barite because of its low quality. A national program was drafted containing technical measures to improve the quality of barite concentrates. To meet future demand, there is a need to develop the Ansay and the Chaganak deposits (Daukeev, 1995, p. 118).

Chromite

Reserves.—All chromite production was from the Donskoy group of deposits near Khromtau in the Aqtobe (Aktyubinsk) region, with more than 430 Mt of reserves averaging 50.3% Cr_2O_3 (Kruse and Parchmann, 1998, p. 53, 54).

Production Status.—Kazakhstan is among the world's leading producers of chromite. More than one-half of chromite production was exported; the remainder was used domestically for ferroalloy production, which was exported. More than 90% of the country's total output of chromite and ferroalloys was exported (USAID Kazakhstan Securities Market Development Project, [no date], Kazchrome, accessed May 20, 1999, at URL http://www.kazecon.kz/English/privatkazchrome.htm).

Production Development.—The Donskoy mining and beneficiation complex was the exclusive producer of chromite in the country. Mining was being switched to underground methods with the depletion of reserves suitable for open-pit development. Kazakhstan has the ability to increase chromite output by 10% to 12% compared with its peak level of more than 3.6 Mt/yr in 1990 by using low-grade ores in ore folds. Chromite exports were projected to decrease as the country expands ferroalloy production (Zharkenov, 1997).

Ownership Status.—The Kazchrome Transnational Company (KCM) was established in 1996 with the transfer of 90% of the common stock of the Donskoy mining and beneficiation complex and the Ferrochrome concern, comprising the country's two ferroalloys plants, to KCM. KCM was under the management of the Japan Chrome Corporation (a subsidiary of the Trans World Group of the United Kingdom), which also owned the controlling block of shares of KCM (USAID Kazakhstan Securities Market Development Project, [no date], Kazchrome, accessed May 20, 1999, at URL http://www.kazecon.kz/English/privatkazchrome.htm).

Coal

Reserves.—Kazakhstan had more than 400 coal deposits containing more than 30 billion metric tons of reserves. Major deposits were in the Ekibastuz, the Karaganda, the Maykuben, and the Turgay basins and at the Borly, the Karazhir (Yubileynyy), the Kuu-Cheku, the Priozernoye, and the Shubarkol deposits (Daukeev, 1995, p. 122; Kruse and Parchmann, 1998, p. 41, 42). About one-third of reserves were brown coal. The Karaganda basin was the only supplier of coking coal for the metallurgical industries. The Ekibastuz basin was the chief supplier of coal for powerplants (Daukeev, 1995, p. 124).

Production Status.—Kazakhstan was a major coal-producing country. It had been producing more than 130 Mt/yr of coal in the 1980's, but by 1997, production has fallen by about 45%. In 1997, Kazakhstan consumed about 55 Mt and was a coal exporter to Russia and other CIS countries, even though it imported coal from the Kuznetsk basin in Russia to supply its eastern regions. Coal supplied to powerplants often had an ash content much higher than the average for energy coal available on the world market (Daukeev, 1995, p. 120).

Production Development.—Reserves at most operating mines were adequate to maintain production for 20 years or more. The underground mining of coking coal at Karaganda, however, was expensive and added to the cost of metal production. Development of the Karazhir deposit, with more than 1 billion tons of reserves of high-quality coal suitable for surface mining, was made possible by the shutdown of the Semipalatinsk nuclear testing grounds. With the development of Karazhir, the eastern regions of the country will no longer need to import coal (Daukeev, 1995, p.124-125).

Ownership Status.—In 1996, the Karaganda and the Ekibastuz production associations were dissolved and the mines put up for sale or lease. In the Karaganda basin, 15 of the mines were sold to the Karaganda iron and steel company Ispat-Karmet. That year the Shubarkol mine was leased to the Global Mineral Resources (GMR) firm registered in the United States (Peck, 1999). In 1998, the management contract with GMR was nullified by the Government of Kazakhstan. In the Ekibastuz basin, several mines and an open pit changed hands. Access Industries, a U.S. firm, purchased the Bogatyar mine and a 70% interest in the Stepnoy mine. Japan Chrome Corp., a subsidiary of Trans World Group, purchased the remaining 30% interest in the Stepnoy mine, as well as the Vostochnyy open pit. Ownership of the Severnyy mine was acquired by Unified Energy Systems, a Russian firm. In 1996, the German firm HTD GmbH acquired a 50% stake in the Maykuben pit in the Maykuben basin (Peck, 1999). In 1997, ZhezkazganTvetMet purchased the Borly coal mine, which became part of the copper production amalgamation KazakhMys Inc. joint stock company (USAID Kazakhstan Securities Market Development Project, [no date], JSC Kazakhmys Cu, accessed May 20, 1999, at URL http://www.kazecon.kz/Memos/Eng/KAZM.htm).

Copper

Reserves.—Kazakhstan reportedly has about 36.6 Mt of proven reserves of copper metal (USAID Kazakhstan Securities Market Development Project, [no date], JSC Kazakhmys Cu, accessed May 20, 1999, at URL http://www.kazecon.kz/Memos/Eng/KAZM.htm). Of its total reserves, 39% are in copper porphyry deposits; 30%, in cupriferous sandstone deposits; and 13%, in copper pyrite deposits (Daukeev, p. 32-42). The major deposits are the Zhezkazgan, Aktogia (Semipalatinsk region), and Boshekul-Maikain (Pavlodar region). Significant reserves are in the following deposits: Rudnyy Altay (East Kazakhstan region), Yuzhniy Dzhungariya (Taldy Kurgan region), Kendyktas [Zhambyl (Dzhambul) region], and Mugodzhariya [Aqtobe (Atyubinsk) region]. Reserves average 0.68% copper for the country (Daukeev, 1995, p. 32-42; Uzhkenov, 1997).

Production Status.—In 1997, Kazakhstan ranked 12th in the world in mine output of copper. The majority of mine output came from the Zhezkazgan region. Approximately 55,000 people were employed in mining and processing copper. The country was a large copper exporter (USAID Kazakhstan Securities Market Development Project, [no date], JSC Kazakhmys Cu, accessed May 20, 1999, at URL http://www.kazecon.kz/Memos/Eng/KAZM.htm).

Production Development.—The reserves being exploited composed only 35% of total enterprise reserves and 11% of total reserves. Nevertheless, problems of adequate reserves exist at the two major copper producing enterprises, the Balkhash and the Zhezkazgan mining and metallurgical complexes in central Kazakhstan (Zharkenov, 1998).

Ownership Status.—Almost all copper-producing enterprises have been amalgamated into KazakhMys Inc. joint stock company, which was a vertically integrated company controlling mining, beneficiating, smelting, and refining. Samsung Deutschland, a subsidiary of Samsung of the Republic of South Korea, owned the largest percentage of shares of KazakhMys and had the management contract for the ZhezkazganTvetMet mining and metallurgical enterprises, which produced the majority of the country's copper.

The formation of KazakhMys began in May 1996. Samsung won a tender to purchase 40% of ZhezkazganTsvetMet, and in April 1997, Samsung purchased the Balkhash mining and beneficiation complex and the Zhezkent beneficiation plant; in May 1997, Samsung purchased the East Kazakhstan copper-chemical complex and the Borly coal mine and incorporated all its holdings into ZhezkazganTsvetMet. Then, in August 1997, Samsung formed KazakhMys on the basis of ZhezkazganTsvetMet and transferred ownership of the Balkhash, Borly, the East Kazakhstan copper-chemical complex, and Zhezkent from ZhezhkazganTsvetMet to KazakhMys.

Samsung has been purchasing the shares of ZhezhkazganTsvetmet that it won the right to purchase via tender. The Government owned the second largest percentage of shares of ZhezkazganTsvetMet, and was planning to offer a percentage of its shares for sale. Samsung also had the right to purchase a percentage of the remaining Government shares (USAID Kazakhstan Securities Market Development Project, [no date], JSC Kazakhmys Cu, accessed May 20, 1999, at URL http://www.kazecon.kz/Memos/Eng/KAZM.htm).

Gold

Reserves.—Kazakhstan's gold reserve base was reportedly about 800 metric tons (t) of gold in ore grading on average 6.3 grams per ton (g/t gold with the gold content of ore in deposits under development grading on average 8.97 g/t. The country has 134 primary lode deposits with 61.5% of reserves, 60 polymetallic sulfide ore deposits with 38% of reserves, and 30 placer deposits with 0.5% of reserves (Kruse and Parchmann, 1998, p. 78). Only 41% of the ore in the reserve base can be processed by using simple gravitation and flotation technology. The remainder has been categorized as being more difficult to beneficiate (Uzhkenov, 1997).

Production Status.—Approximately one-half of the country's gold output had been a byproduct of nonferrous metals mining, and a program was underway to develop primary gold deposits (Daukeev, 1995, p. 93). Gold was mined at about 65 deposits (Uzhkenov, 1997, p. 22). A large percentage of the gold extracted was refined in Kazakhstan.

Production Development.—The program "Gold of Kazakhstan" called for increasing gold extraction to more than 50 t/yr and creating additional facilities for processing gold ores in the country. To accomplish this, the Ministryof Geology issued licenses for exploration and extraction to about 70 commercial entities (Zharkenov, 1997). To achieve this increase in output, the Ministry of Geology estimated that more than $1 billion in investment will be required (Uzhkenov, 1997). Another important component of the program was to introduce new technology, including heap leaching, to recover gold from wastes (Zharkenov, 1997).

Ownership Status.—In January 1993, the principal mining and beneficiation enterprises were placed under the control of the state firm Altynalmas. Foreign investment was being sought for mines under Altynalmas' control. Asier, a state-owned firm, was created to hold the Government's interest in joint ventures involving mines for which foreign investment was obtained. Also, foreign firms could own a 100% interest in gold mines, as well as engage in management contracts with options to purchase shares of the mines (Peck, 1998, p. 29-32).

Iron ore

Reserves.—At the beginning of 1997, Kazakhstan reportedly had an iron ore reserve base of 16.9 billion tons in 27 deposits, of which 9.1 billion tons were proven reserves in categories A,B,C1 (Uzhkenov, 1997). The average iron content of proven reserves is 38.9%. The Minister of Energy and Natural Resources stated that there were 12.5 billion tons of economic iron ore reserves. Of these economic reserves, 40% were characterized as composing ore suitable for direct shipping or as being easy to beneficiate (Uzhkenov, 1997). Skarn magnetite deposits supplied the Sokolovsko-Sarbay and other mining enterprises, sedimentary brown hematite deposits supplied the Lisakovskiy and other mining enterprises, and vulcanogenic-sedimentary-hematite-magnetite deposits supplied the West Karazhal mining enterprise (Kruse and Parchmann, 1998, p. 49).

Production Status.—Since 1990, iron ore production has fallen sharply. In 1997, mining enterprises were working at less than 50% of capacity (Uzhkenov, 1997). Iron ore was used to supply the country's iron, steel, and ferroalloys industries; a significant portion was also exported, mainly to Russia and China. In Kazakhstan and Russia, the significant decline in ferrous metals production decreased demand for iron ore.

Production Development.—Plans called for stabilizing iron ore production at a level of 15 to 16 Mt/yr. Reserves are considered to be adequate for the next century. These production levels will be attained following a decrease in output at the Sokolovskiy and the Sarbayskiyi open pits and the intended closing down of the unprofitable Sokolovskiy underground mine and the Kruzhunkul'skiy open pit. Domestic demand was expected to stabilize, as well as demand for exports. Development was planned for the Kacharskiy mining and beneficiation complex with the participation of Russian or other interested foreign investors to produce iron ore and pellets with a high iron content. Plans called for maintaining production at the Lisakovskiy mining and beneficiation complex by introducing state-of-the art technology for processing low-grade ore. To reduce costs in the ferrous metals production sector, the quality of ore delivered to the Ispat-Karmet steel mill will have to be improved (Zharkenov, 1997).

Ownership Status.—In 1995, management of the country's largest mining enterprise, the Sokolovsko-Sarbay, was transferred to Ivedon International, which, although registered in Iceland, was a joint venture of the Trans World Group and Kazakhstan Mineral Resources (KMRC). In 1966, a 51% stake in the country's second largest mine, the Lisakovskiy, was purchased by the Yesil enterprise, a financial-industrial company from Kazakhstan. In 1997, an 80% stake in the Atasuruda mine, which supplied the Ispat-Karmet steel mill, was purchased by the Kazakhstan firm ELROVO (Peck, p. 20-23).

Lead and Zinc

Reserves.—Reserves of lead reportedly totaled 14.9 Mt and of zinc 34.7 Mt (Kruse and Parchmann, 1998, p. 67). The ore is low grade, averaging 1.31% lead and 3.11% zinc (Uzhkenov, 1997). Major deposits that have been developed were the Grekhovskiy and the Zyryanovskiy, which supplied the Zyryanovsk complex; the Ridder-Sokolnoye, the Shubinskoye, and the Tishinskoye, which supplied the Leninogorsk complex; the Belousovskiy and the Beresovsko-Irtysh deposits, which supplied the Irtysh complex (which appears to have ceased operations); the Kamyshinskoye, the Nikolayevskoye, and the Shemonaikhinskoye, which supplied the East Kazakhstan copper-chemical complex; the Orlovskoye, which supplied the Zhezkent complex; the Ushkatyn III and the Zhayrem, which supplied the Sary-Arkapolimetal complex; the Karagayliskoye, which supplied the Akchatau complex; the Koksu, the Tekeli, the Tulyuk, and the Zapadnyy, which supplied the Tekeli complex; and the Ansayskoye, the Bayzhansai, the Mirgalimsayskoye, and the Shalkia, which supplied the Achisay complex. Two major deposits slated for development in eastern Kazakhstan were the Artemyevskoye and the Maleyevskoye (Daukeev, 1995, p. 43-58). The largest deposits, the Shalkia and the Zhayrem, had 28% of the country's lead reserves and 34% of its zinc reserves (Uzhkenov, p. 1997).

Production Status.—Kazakhstan had been the major producer of lead and zinc among the republics of the Soviet Union, and has remained the largest producer of these metals of the countries of the FSU. Production has fallen by about 85% for lead and by about 55% for zinc from peak output levels in the 1980's. Peak mine output was 207,600 t/yr for lead and 494,900 t/yr for zinc (Uzhkenov, 1997). Major lead and zinc mining and metallurgical enterprises were part of the Kazzink company, which was the country's main producer of lead and zinc. It included the Ust-Kamenogorsk, the Zyryanovsk, the East Kazakhstan copper-chemical, and the Tekeli complexes. Kazzinc contained five mines, two zinc plants, and one lead plant, and employed 26,000 people [(USAID Kazakhstan Securities Market Development Project, [no date], KAZZINC, accessed May 20, 1999, at URL http://www.kazecon.kz/English [using the heading Description of companies activities and status])]. Although mines and beneficiation plants were working at far below capacity, the country fully met its domestic demands for lead and zinc, as well as exported large amounts of these metals (Uzhkenov, 1997, p. 20).

Production Development.—The Ministry of Energy and Natural Resources claimed that economic reserves at existing enterprises were adequate for ensuring an additional 25 years of production, although not specifying the level of production (Uzhkenov, 1997, p. 19). Plans called for developing the Artem'yevskoye, the Chekmarskoye, the Maleyevskoye, and the Yubileyno-Snegirikhinskiy deposits and further developing the Irtysh, the Nikolayevskoye, the Shemonaikhinskoye, the Shalkia, the Tishinskoye, the Zhayrem, and other deposits (Uzhkenov, 1997; Zharkenov, 1997). Plans also called for modernizing zinc production facilities at Kazzinc [(USAID Kazakhstan Securities Market Development Project, [no date], KAZZINC, accessed May 20, 1999, at URL http://www.kazecon.kz/English [using the heading Description of companies activities and status])].

Ownership Status.—In January 1997, Kazzinc company was formed as a result of the amalgamation of the country's largest lead and zinc producers. Kazzinc included the Ust-Kamenogorsk metallurgical complex and the Leninogorsk, the Tekeli, and the Zyryanovsk mining and beneficiation complexes. Kazzinc's main shareholder was Kazastur Zinc AG, which owned 62.4% of the shares, and was created by Glencore International AG of Switzerland and Asturiana de Zinc of Spain [(USAID Kazakhstan Securities Market Development Project, [no date], KAZZINC, accessed May 20, 1999, at URL http://www.kazecon.kz/English [using the heading Description of companies activities and status])].

In 1997, the Shymkent lead smelter was under the management of RR Kazakhstan-Trade, the Akchatau mining and beneficiation complex was under the management of Novo-Trading of Switzerland, and the Achisay mining and beneficiation complex was under the management of River International. These three management companies were experiencing considerable difficulties in 1997, and it was not certain that these management contracts would remain in effect (Peck, 1998, p. 15-19).

Manganese

Reserves.—Kazakhstan had 11 identified manganese deposits with a total reserve base of 600 Mt of ore, of which 426 Mt were classified in reserve categories A,B,C1. According to the Minister of Energy and Natural Resources, 558.7 Mt was economic reserves. The average manganese content of the economic reserves is 20.5%, which is low grade. High quality ore averaging 40% manganese is in the Kamys and the Ushkatyn-III deposits, which composed 0.2% of reserves (Uzhkenov, 1997).

Production Status.—In 1997, Kazakhstan's three manganese mining enterprises were working at less than 20% of their design capacity of 2.55 Mt/yr of crude ore (Uzhkenov, 1997).

Production Development.—The commissioning of ferromanganese and other manganese products (dioxide, chemical compounds, etc.) production increased domestic demand for manganese. Reserves were considered adequate for the next century (Uzhkenov, 1997). To meet domestic demand, plans called for doubling manganese concentrate production to between 550,000 and 600,000 Mt/yr by 2000 with crude ore extraction totaling 1 Mt/yr. Plans also called for eventually tripling current levels of output to supply domestic ferroalloy producers, as well as for export (Uzhkenov, 1997).

Ownership Status.—The country's three manganese mining enterprises—Atasuruda, Kazakhmarganets, and Sary-Arkapolimetal, which is associated with the Zhayrem mine—were under the management of the Swiss firm Nakosta, which also owned shares or had some ownership options in these enterprises (Uzhkenov, 1997, p. 18).

Natural gas

Reserves.—Kazakhstan reportedly had 900 million cubic meters of proven gas reserves (Uzhkenov, 1997). More than 40% of its reserves were in the giant Karachaganak field in the northwestern part of the country. There are large reserves of associated gas from oilfields, including the Tengiz field (U.S. Department of Energy, January, 1999, Kazakhstan, accessed June 8, 1999, at URL http://www.eia.doe.gov/emeu/cabs/kazak.html).

Production Status.—Kazakhstan was not a major gas producer and had difficulty supplying domestic consumers because the domestic gas sector lacked pipelines. Although six gas pipelines connected Kazakhstan to other Central Asian countries and Russia, the country's gas-producing areas in the west were not connected by pipelines to domestic consumers in the populous southeast, east, and industrial north. In 1997, Kazakhstan exported its gas production from the western part of the country to Russia and imported 40% of its gas consumption needs from Turkmenistan and Uzbekistan along with a small amount from Russia. However, Uzbekistan stopped deliveries in 1988 because of unpaid bills (U.S. Department of Energy, January 1999, Kazakhstan, accessed June 8, 1999, at URL http://www.eia.doe.gov/emeu/cabs/kazak.html).

Production Development.—Construction of a domestic pipeline was under consideration to transport gas from Kazakhstan's western fields to all regions of Kazakhstan (U.S. Department of Energy, January 1999, Kazakhstan, accessed June 8, 1999, at URL http://www.eia.doe.gov/emeu/cabs/kazak.html). Agreements for development of the Karachaganak oilfield and gasfield were signed with a foreign consortium of major oil companies in November 1997. The 40-year agreement with the Kazakhstan Government for the development of the Karachaganak field was expected to lead to the production of approximately 170,000 barrels per day of oil and 500 cubic meters per day of gas by 2000 (UN-ECE, November 2, 1997, Gas centre database Kazakhstan, Highlights, accessed June 13, 1999, at URL http://www.gascentre.unece.org/ungcpubdb/O_KZ.HTM).

Ownership Status.—The members of the offshore exploration consortium for development of the Karachaganak oilfield and gasfield are Total, Royal Dutch/Shell Group, an alliance between British Petroleum Co. plc and Norway's Statoil, BG, Agip and Mobil, as well as the Kazakhstan state entity, KazakhstanCaspishelf (UN-ECE, November 2, 1997, Gas centre database Kazakhstan, Highlights, accessed June 13, 1999 at URL http://www.gascentre.unece.org/ungcpubdb/O_KZ.HTM).

Petroleum

Reserves.—Kazakhstan's Ministry of Energy and Natural Resources reported proven geologic oil reserves to be 6.4 billion metric tons. Reserves are in the Precaspian, the Ustyurtsko-Buzashinskiy, the Mangistauskiy, and the Yuzhno-Turgayskiy basins (Uzhkenov, 1997). The largest oilfields are concentrated in western Kazakhstan where the Tengiz field is located.

Production Status.—Kazakhstan was the FSU's second largest oil producer after Russia. Almost one-half of Kazakhstan's oil production came from three large onshore fields—Karachaganak, Tengiz, and Uzen. Kazakhstan was seeking to develop its oil resources through foreign investment. International projects included joint ventures, production-sharing agreements, and exploration/field concessions. The largest of these was the Tengizchevroil joint venture concluded in April 1993, to develop the Tengiz oil field with 6 billion to 9 billion barrels of estimated oil reserves. In 1997, Tengizchevroil exported about 170,000 barrels per day (b/d) of crude oil through existing Russian pipeline routes, as well as by barge and rail (U.S. Department of Energy, January, 1999, Kazakhstan, accessed June 8, 1999, at URL http:// www.eia.doe.gov/emeu/cabs/kazak.html).

Production Development.—Kazakhstan needed to resolve two major issues to increase oil production. One was the development of export routes to bring Kazakhstan's oil to world markets. The other was that development of the Kazakhstan's offshore oil potential in the Caspian Sea had been slowed by a dispute over ownership rights among Caspian Sea littoral states concerning how the Caspian Sea should be divided under international law (U.S. Department of Energy, January, 1999, Kazakhstan, accessed June 8, 1999 at URL http://www.eia.doe.gov/emeu/cabs/kazak.html).

Chevron Oil Corp. believed that it could reach peak production of 750,000 b/d from Tengiz by 2010. For the Tengizchevroil joint venture to produce at planned capacity would require additional pipeline capacity. To meet this requirement, a new pipeline will be built. Tengiz oil will be exported by the CPC to world markets via a new 900-mile pipeline connecting to the Russian Black Sea port of Novorosiisk (U.S. Department of Energy, January, 1999, Kazakhstan, accessed June 8, 1999 at URL http://www.eia.doe.gov/emeu/cabs/kazak.html).

Ownership Status.—Of the large state-owned oil production associations that existed in Kazakhstan in 1991 when it was part of the Soviet Union, several attracted foreign investment. In 1993, the production association Tengizneftgaz became the base for the Tengizchevroil joint venture with Chevron. Members of the Tengizchevroil joint venture as of 1997 were Chevron (45%), Kazakhoil (25%), Mobil (25%), and LukArco (5%). In April 1997, Kazakhstan sold a 70% stake in Mangistaumunaigaz to Indonesia's Central Asia Petroleum. In 1996, the Yuzhneftegaz production association was sold by tender to the Canadian firm Hurricane Hydrocarbons Ltd; the new enterprise was named Hurricane Kumkol Munai (Peck, 1998, p. 41, 42). In 1997, shares in the Aktobemunaigaz and the Uzenmunaigaz production associations were sold to the Chinese National Petroleum Company which has proposed to construct a pipeline to China. In 1998, the Government transferred its public shares in production and refining companies to the state oil and gas company KazakhOil as a preliminary stage for possible privatization (U.S. Department of Energy, January 1999, Kazakhstan, accessed June 8, 1999, at URL http://www.eia.doe.gov/emeu/cabs/kazak.html). In 1998, the Kazakhstan Government's shares in the joint ventures were transferred to the state firm KazakhOil (Peck, 1999).

Phosphate Rock

Reserves.—Kazakhstan reported economic reserves of phosphate rock as of January 1, 1993, at 785 Mt of P_2O_5 in reserve categories A,B,C1. Of these reserves, 650 Mt was in the Karatau basin, and the remaining 135 Mt in the Aktyubinsk basin. In terms of phosphate rock, reserves in the Karatau basin as of January 1, 1993, totaled about 2.6 billion tons of which about 600 Mt was deemed suitable for surface mining (Daukeev, p. 110).

Production Status.—In the 1980's, Kazakhstan had ranked as one of the world's leading phosphate rock producers, although almost all its output was consumed within the Soviet bloc. The drop in phosphate rock production following the dissolution of the Soviet Union was precipitous. In 1993, owing to falling demand, production ceased at the Chilisay complex in the Aktyubinsk region and production at Karatau had fallen sharply (Daukeev, p. 110). The Karatau mines reportedly were mostly idle in 1997 and the first part of 1998. Plants in Uzbekistan, which were the main users of Karatau phosphates, were unable to make payments for the phosphate rock (Louis, 1998, p. 35).

Production Development.—The future of the industry is uncertain with mining capacity idle for long periods at Karatau and the closure of the Chilisay mining complex. Reserves are adequate, but the industry cannot revive until demand revives. The country again could become a regional supplier of phosphate raw materials when the economies of the Central Asian countries again are in a position to produce and purchase fertilizer. In 1999, it was announced that the Kazakhstan firm Aktal Ltd. intended to develop the Kok-Dzhon phosphate rock deposit in the Karatau basin (Interfax Mining and Metals Report, 1999b).

Ownership Status.—The closure or idling of most production capacity, coupled with the fact that the industry served primarily regional markets, kept it from being a prime target of foreign investment. Two mills at the Karatau deposit, however, although idle, were under the management of the Hong Kong firm Texuna (Interfax Mining and Metals Report, 1999b).

Steel

Production Status.—Kazakhstan was of only regional importance as a steel producer. It had one steel mill that produced more than 6.7 Mt of crude steel in 1990. Steel production, however, has fallen by more than 50% since then.

Production Development.—Under the foreign management and ownership of Ispat International of the United Kingdom, production appeared to be reviving. In 1998, the Karaganda steel mill, renamed Ispat-Karmet, succeeded in attracting $473 million in investment from the European Bank for Reconstruction and Development and the International Finance Corp. to upgrade production facilities (Metal Bulletin, 1998). In 1998, Ispat-Karmet's exports were affected by falling demand in Southeast Asia, and the company was seeking new export markets. Following a small drop in production in 1998, plans called for Ispat-Karmet to increase production by 15% to more than 3 Mt in 2000 (Metal Bulletin, 1998).

Ownership Status.—In November 1995, Ispat-International acquired the management contract for the Karaganda steel mill, following the failure of an initial contract with the Eisenberg Group, a subsidiary of U.S. Steel Group. Ispat also exercised its option to purchase the steel mill and has purchased in addition the Karaganda powerplant and 15 coal mines in the Karaganda region, a number of which Ispat may close (Peck, 1998, p. 23-25).

Titanium

Reserves.—Prior to the breakup of the Soviet Union, Kazakhstan had received all its raw material for titanium production from Ukraine and Russia. It received titanium slag from Ukraine and carnallite from Russia. Following the dissolution of the Soviet Union, Ukraine and Russia curtailed shipments to Kazakhstan. Kazakhstan then began importing slag from the West and magnesium metal and liquid chlorine instead of carnallite from Russia. Kazakhstan had identified a number of ilmenite deposits and Specialty Metals, the owner of Kazakhstan's Ust-Kamenogorsk Titanium-Magnesium Plant (UKTMP), was seeking a pool of investors to develop these deposits (Gehler, 1998). Development reportedly has begun of domestic placer deposits in the north and west of the country with identified reserves of about 3 Mt of TiO_2 (Kruse and Parchmann, 1998, p. 57).

Production Status.—In the late 1980's, Kazakhstan and Russia were the world's leading producers of titanium sponge; UKTMP had the capacity to produce more than 40,000 t/yr of sponge, making it the world's largest titanium sponge plant. In 1990, Kazakhstan produced 38,822 t of sponge. By 1994, production at UKTMP had fallen to less than 4,000 t of sponge (Gosudarstvennyy Komitet Respubliki Kazakhstan Po Statistike I Analizu, 1996, p. 179). Production then began increasing, doubling the next year. In 1997 and 1998, Kazakhstan was estimated to be the world's third largest producer of titanium sponge (Gambogi, 1999, p. 182-183). Capacity at UKTMP, however, was less than that during the Soviet period.

Production Development.—Efforts have been made by UKTMP to meet the requirements of the western titanium industry. Quality controls were introduced that resulted in certification of sponge from UKTMP by airplane engine manufacturers, including Pratt Whitney, Rolls Royce, General Electric Co., and SNECMA. UKTMP has been developing titanium slag production and also pigment production based on production of excess slag (Gehler, 1998).

Ownership Status.—As of 1998, the Belgian firm Speciality Metals Company SA owned a 65% share of UKTMP, with 15.5% of the shares still held by the State, 14.5% by the management and staff of the plant, and 0.5% in the hands of local funds (Gehler, 1998).

Uranium

Reserves.—According to Kazakhstan's Ministry of Energy and Natural Resources, the country's natural uranium reserves were assessed at 469,700 t in categories B,C1, of which 456,000 t was assessed as capable of being produced at less than $80 per kilogram. The country's major deposits are the Kokshetauskaya in the East Kazakhstan region, the Mangyshlakskaya in the Prikaspiyskaya region, the Kendyktas-Chuili-Bekpakdalinskaya in the Pribalkhashskaya region, and the Illiiyskaya in the Chu-Syrday'inskaya region. In total, there are 53 known deposits Uzhkenov. 1997).

Production Status.—Kazakhstan was the largest producer of uranium in the Soviet Union, but since the dissolution of the Soviet Union, production was estimated to have fallen by more than two-thirds. Kazakhstan's final product was U_3O_8 with a natural uranium content of about 87% produced at the Tselinny mining and metallurgical complex. Production was limited by demand on world markets. In 1992, Kazakhstan's main customer, Russia, practically ceased purchases, and domestic demand was almost nil(Uzhkenov. 1997).

Production Development.—The situation in the industry should improve with the planned development of a serious of domestic nuclear powerplants. There is much spare capacity to meet demand domestically and on the world market. However, to increase output to former levels of 3,200 to 3,500 t/yr of U will require renovation of existing enterprises, development of new mines, and introduction of underground leaching technology (Uzhkenov, 1997).

Ownership Status.—The Government firm KazAtomProm held the state share in uranium mining and processing enterprises. In 1996, the Canadian firm World Wide Minerals Ltd entered into an agreement to manage the Tselinny uranium mining and chemical complex with the option to purchase a 90% stake in Tselinny. (J.G. Wade, November 15, 1996, World Wide makes "go" decision on Kazakhstan uranium project, November 15, 1996, accessed on June 7, 1999, at URL http://www4.techstocks.com/~wsapi/investor/subject-11296). The cancellation of the management contract with World Wide Minerals in 1997 resulted in a legal dispute (World Wide Minerals Ltd., May 31, 1999, Corporate profile, accessed on June 7, 1999, at URL http://www.worldwideminerals.com/WWS/InvRel.nsf/Public). The Inkai joint venture was formed in 1966 with the Canadian company Cameco and the German firm Uranearth Exploration and Mining to develop the Inkai deposit; the Katco joint venture was formed in 1966 with Kogema of France to develop a deposit in the Zhambyl region (Peck, 1998, p. 48-50).

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Major Sources of Information

In 1997-98, the capital of Kazakhstan was moved from Almaty to the new capital of Astana (formerly Akmola). Addresses for many of the agencies in Akmola are not yet available, and a number of the phone numbers are still connected to Almaty. Owing to the fact that many of the agencies are in the process of moving and a number of them appear to be undergoing organizational changes, the names and addresses listed may not be current or complete. In Astana, the main address of the National Government of Kazakhstan is 11 Mira St., Astana 473000, Republic of Kazakhstan.

National Agency for Statistics at the Ministry of Economy and Trade
125, Abai Avenue
Almaty, 480008
Kazakhstan
Telephone: 621323
Information & Presentation Center of the Mineral Sector of the Republic of Kazakhstan
85, Dostyk Avenue, first floor, Room 103
Almaty, 480100
Kazakhstan
Telephone: 7-(3272)-63 33 23; 63 54 16
Fax: 7-(3272) 63 87 73
Ministry of Natural Resources and Ecology
Astana
Kazakhstan
Ministry of Economy
115 Zheltoksan Street
Astana, 480091

Kazakhstan
Telephone: 00 7 3272 62 65 00
Fax: 00 7 3272 63 66 05
Ministry of Industry and Trade
111 Gogolya Street
Almaty, 480003
Kazakhstan
Telephone: 7-(3272)602-892
Fax: 7-(3272)623-748
Ministry of Finance
97 Abylay Khan Avenue
Astana, 480091
Kazakhstan
Telephone: 00 7 3272 62 40 75
Fax: 00 7 3272 62 27 70

(Note: As of December 1997, there was a merger of the State Property Committee with the Privatization Committee, with the latter becoming the Privatization Department within the Ministry of Finance. The Department will monitor privatization contracts and supervise fulfillment of the terms of tenders.)

Ministry of Energy, Economy, Trade
142 Bogenbay Batyr Street
Astana, 480091
Kazakhstan
Telephone: 00 7 3272 62 6410
Fax: 00 7 3272 62 66 30
Committee of Earth Resources Management
Astana
Kazakhstan
Telephone: 32 02 11
State Committee for Investments
Telephone: 00 7 3272 62 59 03
Fax: 00 7 3272 69 22 37
State Customs Committee
555 Seyfullina Street
Almaty, 480012
Kazakhstan
Telephone: 7-(3272)399-924; Fax: 7-(3272)328-234

State Tax Committee
93/95 Ablai Khan Street
Almaty, Kazakhstan, 480091
Telephone: 7-(3272)620-432
Fax: 7-(3272)624-863
Chamber of Commerce and Industry of the Republic of Kazakhstan
50 Kazybek Bi Street
Almaty
Kazakhstan, 480091
Telephone: 7-(3272)621-446, 621-910
Fax: 7-(3272)507-029
United States-Kazakhstan Council
531 Seyfullina St., Room 405
Almaty, 480083
Kazakhstan
Telephone: 7-(3272)637-098
Fax: 7-(3272)694-803

In the United States:
2000 L Street NW
Suite 200
Washington, DC 20036
Telephone: (202)416-1624
Fax: (202)416-1865
Central Asian-American Enterprise Fund
531 Seyfullina Street, second floor
Almaty
Kazakhstan
Telephone: 7-(3272)654-695, 638-815
Fax: 7-(3272)694-589
In the United States:
595 Madison Avenue
Suite 3000
New York, NY 10022

TABLE 1
KAZAKHSTAN: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1993	1994	1995	1996	1997 e/
METALS					
Alumina	1,091,000 r/	822,300 r/	1,024,500 r/	1,083,000	1,050,000
Arsenic trioxide e/	2,000	1,500	1,500	1,500	1,500
Bauxite	2,911,000 r/	2,584,000 r/	3,319,000 r/	3,140,000 e/	3,100,000
Beryllium, metal e/	100	100	100	100	100
Bismuth, metal	180 r/	85 r/	33 r/	33 r/ e/	50
Cadmium, metal	773 r/	1,097 r/	797 r/	800 r/	900
Chromite	2,968,000 r/	2,103,000 r/	2,417,000 r/	1,190,000	1,800,000
Cobalt, mine output, metal content e/	600	300	300	300	300
Copper:					
Mine output, metal content e/	265,000 r/	210,000 r/ 2/	200,000	250,000	316,000
Metal:					
Smelter, undifferentiated	300,000 e/	285,000 r/ e/	242,800 r/	245,000 r/	310,000
Refined, primary	317,500 r/	278,500 r/	255,600	267,100 r/	301,100
Gold, primary e/ kilograms	20,000 r/	14,483 r/ 2/	18,200 r/	18,000 r/	18,600
Refined	8,648	10,444	10,921	10,000 e/	9,700
Iron and steel:					
Iron ore, marketable	13,129,000 r/	10,521,000 r/	14,900,000	13,200,000 r/	13,700,000
Metal:					
Pig iron	3,544,000	2,432,000	2,528,000	2,536,000	3,000,000
Ferroalloys:					
Ferrochromium	327,896	373,300 e/	511,600 r/	352,000	600,000
Ferrochromiumsilicon	60,800 r/	26,900 r/	21,300 r/	20,000 e/	15,000
Ferrosilicon	418,200 r/	208,200 r/	256,000 r/	119,000 e/	100,000
Silicomanganese e/	--	40,000	20,000	50,000	40,000
Other e/	15,000	10,000	10,000	10,000	9,000
Steel:					
Crude	4,279,000	2,969,000	2,963,000 r/	3,142,000	3,900,000
Finished	3,400,000	2,300,000	2,100,000	2,200,000	3,000,000 2/
Lead:					
Mine output, metal content	95,000 r/ e/	57,000	40,000	35,000 r/ e/	31,000
Metal, refined e/	255,000 r/	13,700 r/	88,500 r/	70,000 r/	76,000
Magnesium e/	2,000	-- 2/	9,000 r/	9,000 r/	8,972 2/
Manganese ore, marketable e/	400,000	400,000	428,000	430,000	400,000
Molybdenum, mine output, metal content e/	100 r/	100 r/	75 r/	100 r/	100
Nickel, mine output, metal content e/	8,500	8,500	9,900 2/	9,800	10,000
Silver e/	500,000	506,000 r/	489,000 2/	467,700 r/2/	465,000
Tin, including secondary	21 r/	14 r/	4 r/	4 r/ e/	4
Titanium, metal	8,354 r/	3,809 r/	9,592 r/	12,500	13,000 e/
Tungsten, mine output, metal content e/	350 r/	122 2/	249 r/2/	-- r/	--
Vanadium, metal content	800 r/	878	924	900 e/	900
Zinc:					
Mine output, metal content e/	250,000	190,000	225,000	225,000	225,000
Metal, smelter	238,500 r/	172,500 r/	169,200 r/	168,500	170,000
INDUSTRIAL MINERALS					
Asbestos, all grades	130,000 r/ e/	130,000 r/ e/	128,400 r/	128,700 r/	125,000
Barite	210,300 r/	90,200 r/	83,000 r/	50,000 r/e/	38,000
Boron	8,000 r/	7,000 r/	7,000 r/ e/	7,000 r/ e/	7,000
Cement	4,000,000	2,000,000	2,616,000	1,120,000 r/	661,000
Phosphate rock e/	4,000	1,700 r/ 2/	1,400	1,000	--
Sulfur: e/					
Native	-- r/	-- r/	-- r/	-- r/	--
Pyrites	219,000	200,000	71,000	71,000	--
Byproduct:					
Metallurgy	276,000	261,000	131,000	139,000	139,000
Natural gas and petroleum	182,000	219,000	255,000	515,000	806,000
MINERAL FUELS AND RELATED MATERIALS					
Coal	112,000,000	105,000,000	83,200,000	7,660,000	7,260,000 2/
Natural gas million cubic meters	6,700	4,500	4,800	6,400	8,100 2
Petroleum, crude	23,000,000	20,300,000	20,600,000	20,500,000	25,800,000 2/
Uranium concentrate, U content	2,700	2,240 r/	1,630 r/	1,320 r/	1,000 2/

e/ Estimated. r/ Revised.

1/ Table includes data available through July 2, 1999.

2/ Reported figure.

TABLE 2

KAZAKHSTAN: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Metric tons unless otherwise specified)

Commodity	Major operating facility	Location	Annual capacity e/
Alumina	Pavlodar aluminum plant	Pavlodar	1,200,000.
Arsenic, trioxide	Chimkent polymetallic enterprise and other nonferrous metallurgical enterprises	Shymkent (Chimkent) 1/	3,500.
Asbestos	Dzhetygara complex	Qostanay (Kustanay) region 1/	1,000,000 total.
Do.	Chilisay complex	Aqtobe (Aktyubinsk) phosporite basin 1/	
Barite	Karagaylinskiy mining and beneficiation complex	Karagayliy region	300,000 total.
Do.	Tujuk Mine	Almaty region	
Do.	Achisay polymetallic complex	Kentau region	
Bauxite	Turgay, Krasnooktyabr bauxite mining complexes	Central Kazakstan	600,000 total.
Beryllium, metal	Ulbinskiy metallurgical plant	Oskemen (Ust-Kamenogorsk) 1/	NA.
Bismuth, metal	Ust-Kamenogorsk lead-zinc metallurgical plant	do.	70 total.
Do.	Leninogorsk lead smelter	Leninogorsk	
Cadmium	Leninogorsk mining and beneficiation complex	do.	1,200.
Chromite	Donskoy mining and beneficiation complex	Khromtau region	3,800,000.
Coal	Karaganda Basin	Central and north-central parts of the country	50,000,000.
Do.	Ekibastuz Basin	do.	85,000,000.
Do.	Maykuben Basin	do.	10,000,000.
Do.	Turgay Basin	do.	1,000,000.
Copper, mining, recoverable copper content	Balkhash	Zhezkazgan (Dzhezkazgan) region 1/	200,000.
Do.	Dzhezkazgan	Zhezkazgan region	250,000.
Do.	Irtysh	Ertis (Irtysh) region	10,000.
Do.	Leninogorsk	Leninogorsk region	15,000.
Do.	Zhezkent	Zhezkent region	25,000.
Do.	Zyryanovsk mining and beneficiation complexes	Zyryanovsk region	5,000.
Do.	East Kazakhstan copper-chemical complex	East Kazakhstan region	10,000.
Copper, metallurgy, metal	Balkhash	Zhezkazgan region	150,000.
Do.	Zhezkazgan	do.	250,000.
Do.	Irtysh smelting and refining complex	Ertis region	40,000.
Do	Ust-Kamenogorsk plant	Oskemen	37,100 (blister copper) 2/ 6,600 (refined copper) 2/
Ferroalloys	Aktyubinsk plant	Aqtöbe	High-carbon 60% ferrochrome, 150,000; medium-carbon 60%, ferrochrome, 130,000.
Do.	Aksu (Yermak) plant	Aksu (Yermak) 1/	Ferrosilicon 700,000; ferrosilicochrome, 700,000; high-carbon ferrochrome 400,000. silicomanganese, 90,000.
Gallium	Pavlodar aluminum plant	Pavlodar	NA.
Gold	Byproduct of polymetallic ores and native gold mining	Byproduct gold colocated with non-ferrous metals mining	30.
Iron and steel:			
Pig iron	Ispat-Karmet Steelworks	Karaganda	5,000,000.
Steel, crude	do.	do.	6,300,000.
Iron ore, marketable	Sokolovsko-Sarbay, and Lisakovskiy mining and metallurgical complexes	Qostanay region	25,000,000 total.
Lead and zinc, mining: (recoverable lead and zinc content of ore)	Achisay	Kentau and Karatau regions 1/	Lead 40,000, zinc 20,000.

See footnotes at end of table.

TABLE 2--Continued
KAZAKHSTAN: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Metric tons unless otherwise specified)

Commodity	Major operating facility	Location	Annual capacity e/
Lead and zinc, mining: (recoverable lead and zinc content of ore)	Akchatau	Zhezkazgan region	Lead 10,000, zinc 30,000
Do.	Irtysh (apparently closed)	Oskemen region	Lead 10,000, zinc 50,000
Do.	Karagayly	Karagayly region	Lead 20,000 zinc 55,000
Do.	Leninogorsk	Leninogorsk region	Lead 60,000, zinc 120,000.
Do.	Tekeli	Tekeli and Taldyqorghan (Taldi-Kurgan) regions 1/	Lead 20,000, zinc 30,000
Do	Zhezkent	Semey (Semjipalatinsk) region	NA
Do.	Sary-Arkapolimetal	Zhayrang (Zhayrem) region	Lead 20,000, zinc 40,000
Do.	Zyryanovsk complexes	Zyryanovsk region	Lead 20,000, zinc 60,000
Do.	East Kazakhstan copper-chemical complex	East Kazakhstan region	Zinc 15,000.
Lead, refined	Ust-Kamenogorsk plant	Oskemen	145000.
	Shymkent	Shymkent	NA
Manganese, crude ore	Atasurda	Atasu	2,550,000 total.
Do.	Kazakhmarganets	Zhezdy	
Do.	Sary-Arkapolimetall	Zhayrang (Zhayrem) region	
Molybdenum, mining: (recoverable molybdenum content of ore)	Kounrad Mine	Balqash complex	6,000 total.
Do.	Karaobinskoye deposit	Karaoba region	
Do	Sayak deposit	Sayaq (Sayak) region 1/	
Molybdenum, metal	Akchatau molybdenum metal plant	Zhezkazgan region	NA.
Petroleum and natural gas	Aktyubinskmunaigaz	Aqtobe region	28,000,000 (total crude oil 10 million cubic meters (total natural gas).
Do.	Embamunaigaz	Emba districk	
Do.	Huricane Kumkol Munai	Aral Sea region	
Do.	Karachaganak field	Northwestern Kazakhstan	
Do.	Mangistaumunaigaz	Mangghyshlaq (Mangyshlak) Peninsula 1/	
Do.	Tengizchevroil joint venture	Tengiz deposit	
Do.	Uzenmunaigaz	Uzen deposit	
Phosphate rock	Karatau production association	Zhambyl (Dzhambul) and Shymkent regions	10,000,000 total.
Do.	Chilisay mining directorate	Aqtobe phosphorite basin	
Rare metals (columbium, indium, selenium, tellurium).	Aktau complex	Aktau (Shevchenko)	NA.
Do.	Belogorsky rare metals plant	Belgorsiy (Belogorsk) 1/	NA.
Do.	Chimkent polymetallic plant	Shymkent	NA.
Do.	Ust-Kamenogorsk lead-zinc plant	Oskemen	NA.
Do.	Akchatau mining and beneficiation complex	Zhezkazgan region	NA.
Rhenium	Balkhash copper mining and metallurgical complex	do.	NA.
Tantalum	Yermak ferroalloy plant	Aksu	NA.
Tin	Akchatau mining and beneficiation complex	Akzhal deposit, Zhezkazgan region	700.
Titanium, metal	Ust-Kamenogorsk titanium-magnesium plant	Oskemen	35,000.
Silver, byproduct	Ust-Kamenogorsk	do.	1,200 total.
Do.	Leninogorsk	Leninogorsk	
Do	Chimkent metallurgical plants	Shymkent	
Uranium, U content	Stepnogosk	Stepnogosk	3,500 total.
Do.	Shevchenko	Aqtau	
Do.	Taboshara	Taboshara	
Do.	Prikaspiskiy ore enrichment center	Aqtau	
Do.	Tselinny chemical complex	Stepnogosk	
Zinc, metal	Leninogorsk	Leninogorsk	106,500. 2/
Do.	Ust-Kamenogorsk plant	Oskemen	215.000. 2/

e/ Estimated. NA Not available.

1/ New names and spellings are given when available. The old name will appear in parentheses the first time the new name is used.

2/ Reported figure.

THE MINERAL INDUSTRY OF

KYRGYZSTAN

By Richard M. Levine

In 1997, Kyrgyzstan reported a 10.4% growth in gross domestic product and a 46.8% increase in industrial output compared with those of 1996 (Interfax Statistical Report, 1998a). A significant factor in Kyrgyzstan's economic success in 1997 was the dramatic increase in gold production, which totaled 17.4 metric tons (t) in 1997 compared with 1.5 t in 1996. The value of output also rose by 44.9% in the fuel sector and by 16.3% in the construction materials sector (Interfax Mining and Metals Report, 1998b; Interfax Statistical Report, 1998b).

Kyrgyzstan's mineral industry was involved in mining and processing mineral products, mining primarily antimony, coal, gold, mercury, molybdenum, tin, tungsten, and uranium. Its metallurgical industry led the former Soviet Union (FSU) in the production of two nonferrous metals, mercury and antimony, as well as rare-earth metals. Several major gold deposits were under development. Although Kyrgyzstan produced coal and some gas and oil, it was significantly dependent on imported energy.

According to a presidential decree, at the beginning of 1997, Kyrgyzstan engaged in a reorganization of its oil and gas industry, merging the three existing companies into a national gas and oil products State joint-stock company Kyrgyzazmunayzat (Kyrgyz Gas and Oil Products). The new company merged the companies Kyrgyzgas (Kyrgyz Gas), Chugazmunayzat (Chuy Gas and Oil Products), and Kyrgyzmunayzat (Kyrgyz Oil Products) (Slovo Kyrgyzstana, 1997).

In February 1993, Kyrgyzstan issued a decree uniting all mining enterprises into the State concern Kyrgyzaltyn. Although some of the enterprises were either scheduled for privatization or were privatized, Kyrgyzaltyn was still the country's largest mining enterprise, producing antimony, antimony oxide, gold, metallic mercury, molybdenum, rare earths, semiconductor-grade silicon, tin, tungsten, and uranium oxide.

Despite having spun off a number of key enterprises, Kyrgyzaltyn accounted for 19.3% of the country's gross industrial output and 31.8% of its exports in 1997. The concern recently stepped up geologic work, enlisting western support. Kyrgyzaltyn was involved in several joint ventures with western companies. It was concentrating its efforts on gold production, although in the past, it controlled such enterprises as the Khaydarkan mercury plant (Osh region), the FSU's largest producer of mercury; the Kyrgyz Chemical and Metallurgical plant (Chu region), which produced rare-earth metals and their compounds; and the Kara Balta uranium mining and processing complex that now also includes a gold refinery. Kyrgyzaltyn relinquished its control of the Kara Balta complex at the beginning of 1997 and the Kyrgyz Chemical and Metallurgical plant and the Khaydarkan mercury plant in July (Interfax Mining and Metals Report, 1997b).

In 1997, Kyrgyzaltyn retained control of the Kadamzhay antimony plant in the Osh region, the FSU's largest producer of metallic antimony and its compounds. Through November, the plant's output decreased by 12.5% compared with that of 1996 primarily because of a 24% drop in raw material supplies from Yakutia in Russia and from Tajikistan (Interfax Mining and Metals Report, 1997b). In 1997, the plant produced 4,400 t of a targeted 7,600 t of antimony and its compounds, of which 1,200 t was produced from raw materials from Kyrgyzstan; 1,200 t, from concentrate supplied by Tajikistan; 500 t, from concentrate supplied by Yakutia; and the remainder from unspecified sources. More than one quarter of the plant's output was achieved with its own raw materials owing to the domestic development of the Kadamzhay and the Tereksay antimony deposits. Despite a 20%-reduction in unit costs during the past 2 years, Kadamzhay's commodities were still finding it difficult to compete on the market. Costs were cut mainly by saving electricity, gas, and heat and by trimming staff. In 1998, the plant planned to produce 6,000 t of antimony (Interfax Mining and Metals Report, 1998a).

In 1997, Kyrgyzaltyn's most successful operation was the Kumtor Gold Company joint venture with Canada's Cameco, which was developing the Kumtor gold lode on the northwestern was slopes of the Akshirak mountain ridge in the Tien-Shan mountain range (Interfax Mining and Metals Report, 1997a). In 1997, Kumtor produced 16.1 t of gold, which was 3 t more than planned, with output in 1998 targeted at 18 t. Kyrgyzstan owned two-thirds of the gold produced by the joint venture, and Cameco, the rest. The Kumtor mine was commissioned in December 1996 (Interfax Mining and Metals Report, 1998b).

Kyrgyzstan agreed to measures to extend the life of the Makmalzoloto gold mining enterprise, a division of Kyrgyzaltyn, until the year 2003. Commercial ores at the open pit in the Dzhalal Abad region were nearing depletion. Kyrgyzaltyn said the open pit possessed only enough prepared ore for another 2 years of operation. The country's Geology Committee, however, said that there were still 2.3 million metric tons (Mt) of commercial ore graded at 4.94 grams per metric ton (g/t) of gold in deeper lodes and 1.4 Mt of marginal ore graded at 1.51 g/t. In addition, some 3.35 Mt of waste graded at 1.7 g/t had been stockpiled. According to a Government plan, these ores should be worked. Makmalzoloto was to acquire certain tax incentives to attract outside investors. The Government ordered Kyrgyzaltyn to start preparing to develop underground mining and heap leaching for the tailings as of January 1, 1998, and to present a final feasibility study, which will take environmental considerations into account, by May 1998. Kyrgyzaltyn also was to substantiate proposals to develop the related Vostochny and Dioritovy sections of the Makmal field, 12 kilometers from the main site. At deep levels, Vostochnyy contains 1.84 Mt of ore graded at 5.56 g/t, and Dioritovy contains 490,000 t graded at 8.57 g/t. Kyrgyzaltyn forecast that Makmalzoloto would finish 1997 with an output valued at 228 million som [about $13 million (1997 average exchange rate was $1 to 17.37 som)], which would be 19.3% lower than that of 1996 (Interfax Mining and Metals Report, 1997a).

Kyrgyzaltyn saw its future mainly in gold. It and foreign companies were jointly prospecting an overall area of 14,740 square kilometers (km^2); the concern has covered 15,160 km^2 since 1995 (accounting for geologic work in 1997). It was partner to four joint geologic ventures. One was Solton Sary, formed in June 1996 and 50% owned by Newmont Mining Corp. of the United States, which succeeded Santa Fe Pacific Gold of the United States as the partner. The venture was studying gold deposits in the 330-km^2 Solton Sary and the 2,000-km^2 Karakala areas in Naryn region. A second was Tien Shan Gold Company, formed in July 1996 with Cameco and holding the license to study the 650-km^2 Bulakash and the 1,760-km^2 Akdzhola areas. Even before this joint venture was formed, the partners prospected the Tokhtazan deposit in the Akdzhola area. A third was Tien Shan Minerals Company, formed in June 1997 and half-owned by America's Phelps Dodge. It was studying the 9,200-km^2 Shakhimardan-Koksui area in the Osh region, southern Kyrgyzstan. The fourth was the Kichi Sandyk project, launched in September 1997, in the Dzhalal Abad region in western Kyrgyzstan. First results reportedly confirmed information obtained in previous years that the region hosts a gold deposit containing at least 30 t of metal. The Kichi Sandyk project was being developed in conjunction with the Metals Mining Agency of Japan and the Japanese International Cooperation Agency. Furthermore, Kyrgyzaltyn was seeking a partner to mine the Jerooy gold lode in the Talass district, with reported proven reserves of more than 70 t of gold (Interfax Mining and Metals Report, 1997b).

Plans called for privatizing the Khaydarkan mercury plant by the middle of May 1998. The Kyrgyz Government listed the Khaydarkan plant as a strategic enterprise in which it will retain majority interest after privatization. The State Property Fund was considering selling some Government shares, mainly to foreign investors. For example, it was willing to offer up to 25% of these shares to the Moscow-based international consortium, Molibden, which specialized in nonferrous metals processing, especially mercury and its compounds, and which produced high-grade antimony. The Khaydarkan plant produced 611 t of mercury in 1997 compared with 584 t in 1996 and 380 t in 1995. All mercury produced in 1997 was exported—of which 411 t went to China; 100 t to the Netherlands; 50 t to Russia and other Commonwealth of Independent States (CIS) nations, and 50 t to the United States (Interfax Mining and Metals Report, 1998d).

In 1997, Khaydarkan also produced 4,176 t of fluorspar concentrate graded at 95%; it bartered 3,000 t with a company in Russia called Ftoral in exchange for aluminum wire. Khaydarkan produced about 3,000 t of fluorspar concentrate in 1996 and targeted production of 5,500 t in 1998 (Interfax Mining and Metals Report, 1998d).

In 1997, Khaydarkan produced 160 t of antimony in concentrate compared with 221 t in 1996. All antimony was sold to the Kadamzhay antimony plant, the Khaydarkan plant's biggest consumer of this commodity. Khaydarkan forecast a surge in antimony ore production in coming years as it develops rich ore bodies in the western section of the Khaydarkan mercury deposit (Interfax Mining and Metals Report, 1998d).

The Kyrgyz Chemical and Metallurgical plant, a rare-earth metals producer that had been insolvent, posted first-quarter 1998 net profits of 2.5 million som (about $144,000), which covered the losses of recent years. The facility spun off social infrastructure, which had been incurring annual losses of 1.5 million som. It produced 16 rare-earth metals (the whole group of lanthanides) plus 16 rare metals. It was introducing new technology to produce europium oxide and had started to produce chemically cooled europium compounds. It was working on a project to increase the diameter of polycrystalline silicon to 20-25 millimeters; production of silicon plates temporarily had stopped owing to lack of demand. Overall sales in 1997 rose by $1.5 million as the number of consumers doubled. The facility tolled raw materials and shipped 98% of its output to countries outside the CIS and 2% to Russia. The Kyrgyz Government, which was seeking a strategic investor as stipulated by a program to denationalize and privatize it, owned 70.06% of the facility (Interfax Mining and Metals Report, 1998c).

Kyrgyzstan's economy has benefited greatly from gold production. The country had become the third largest gold-producer in the FSU. Thus, the future of much of Kyrgyzstan's mineral development, as well as the country's immediate economic prospects, seem to be linked directly with the future of the world gold industry.

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Major Sources of Information

Ministry of Foreign Trade and Industry
106 Chui Ave.
Bishkek 720002
Kyrgyzstan
Telephone: (996-3312) 26 46 76, 22 38 66, 26 48 68
Fax: (996-3312) 22 07 93, 26 27 47
State Customs Committee
4-A Sovetskaya St.
Bishkek 720020
Kyrgyzstan

Telephone: (996-3312) 47 06 02, 47 87 21, 47 96 02,
47 87 50
Fax: (996-3312) 47 85 00, 47 91 12

State Agency of Geology and Mineral Resources
2 Erkindik Blvd.
Bishkek 720739
Kyrgyzstan
Telephone: (996-3312) 22 63 36, 22 63 32, 26 46 26
Fax: (996-3312) 26 86 90

State Agency on Land Management, Land Resources, and Cartographic-Geodetic Service
107 Kievskaya St.
Bishkek 720001
Kyrgyzstan
Telephone: (996-3312) 21 22 96, 21 22 94
Fax: (996-3312) 21 07 72

Agency on Foreign Investments
58-A Erkindik Blvd.
Bishkek 720874
Kyrgyzstan
Telephone: (996 -3312) 22 32 92
Fax: (996-3312) 22 03 63
E-mail: SATC@IMFIKO.BISHKEK.SU

State Concern "Kyrgyzaltyn"
55 Manas St.
Bishkek 720001
Kyrgyzstan
Telephone: (996-3312) 22 09 41, 22 27 68
Fax: (996-3312) 22 72 28

State Joint Stock Company "Kyrgyzenergo"
326, Jibek Joly
Bishkek 720070
Kyrgyzstan
Telephone: (996-3312) 27 29 67
Fax: (996-3312) 27 22 41

National Statistics Committee
374 Frunze St.
Bishkek 720033
Kyrgyzstan
Telephone: (996-3312) 22 74 85
Fax: (996-3312) 22 07 50, 22 07 59

TABLE 1
KYRGYZSTAN: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1993	1994	1995	1996	1997
Antimony: e/					
Mine ouput, Sb content	1,600	1,600 r/	1,600 r/	1,400	1,200 2/
Metal	11,000	9,000	9,000	5,000 r/	4,400 2/
Cement	700,000	400,000	310,000	544,000 r/	658,000
Coal	1,700,000	800,000	474,000	400,000	500,000
Fluorspar concentrate	850 e/	834	850	3,000 r/ e/	4,176
Gold e/ kilograms	1,500	2,050	1,500 r/	1,500 2/ r/	17,400 2/
Mercury:					
Mine output, Hg content e/	300	300	300	500	550
Metal	330 r/	379	380	584 r/	611
Natural gas million cubic meters	40	40	36	26 r/	24
Petroleum, crude	100,000	85,900	88,500	84,300 r/	85,000

e/ Estimated. r/ Revised.

1/ Based on information available through June 1998.

2/ Reported figure.

TABLE 2
KYRGYZSTAN: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity e/
Antimony:			
Metal content of ore	Kadamzhay and Khaydarkan complexes	Kadamzhay, Khaydarkan regions	2.400.
Metal	Kadamzhay metallurgical complex	Kadamzhay region	20,000.
Coal	7 underground mines, 5 open pits	Southwestern, central, and northeastern parts of country	2,200,000.
Cement	Kantskiy cement plant	Kant	1,500,000.
Fluorspar	Khaydarkan mining and metallurgical complex	Khaydarkan deposit	3,000 (fluorspar concentrate).
Gold	Makmalzoloto	Makmal deposit	5
Do.	Kumtor Gold Company	Kumtor deposit	19
Do.	Solton-Sary mine	Naryn region	NA.
Mercury:			
Metal content of ore	Khaydarkan mining and metallurgical complex	Khaydarkan deposit	700.
Metal	do.	Khaykdarkan	1,000.
Petroleum and natural gas million cubic meters	Kyrgyzazmunayzat	Approximately 300 wells; major deposits include Changyr-Tashskoye, Izbaskentskoye, Mayli-Suyskoye, Chigirchikskoye, Karagachskoye Togap-Beshkentskoye, Susaskoye	150,000 (petroleum). 100 (natural gas).
Rare earths	Kyrgyz mining complex	Aktyuz deposit	NA.
Do.	Kyrgyz Chemical and Metallurgical plant	Orlovka	NA.
Uranium	Kara Balta complex	Mines in Min Kush in central, Kadji-Say in eastern, and 'Tyuamuyin in southern Kyrgyzstan, processing plant in Chui region	NA.

e/ Estimated. NA Not available.

THE MINERAL INDUSTRY OF

LATVIA

By Richard M. Levine

Latvia has a small mineral industry engaged primarily in mining peat and industrial minerals, including clays, dolomite, gypsum, limestone, sand for glass and brick production, and sand and gravel for construction uses. The country has a steel mill in Liepaja that has the capacity to produce 550,000 metric tons per year (t/yr) of crude steel and almost 900,000 t/yr of rolled products.

Latvia supplied about 85% of the raw materials for its cement industry. All cement raw material resources are located at fairly shallow depths, and the overburden is primarily glaciated material. In the case of dolomite, gypsum, and sand, surpluses potentially could be produced. All mining was from surface mines. Inadequate reclamation work at surface operations has created severe environmental problems.

In the mid-1980's, there were 3 clay mines producing clay suitable for light concrete aggregates, 14 enterprises producing bricks and drainage pipes, 85 peat deposits under exploitation producing peat for fuel and agricultural uses, a gypsum mining and processing complex, a number of dolomite mines, and 22 sand and gravel pits. No new mineral production facilities appear to have been built since then, and a number of existing facilities may have been shut down.

Except for the output from these mineral industries, Latvia was dependent on imported fuels and other minerals for practically its entire mineral supply. Its open hearth steel mill at Liepaja used and imported raw material.

The port of Ventspils handled 36.8 million metric tons (Mt) of freight which was a 1.1-Mt increase compared with tonnages handled in 1996. Of the total freight, 14.6 Mt was crude oil; 12.5 Mt, petroleum products; 4.359 Mt, potash (compared with 3.633 Mt in 1996); and 2.879 Mt metals, (compared with 2.291 Mt in 1996) (Interfax Statistical Report, 1998a).

According to the data of the Central Statistical Bureau of Latvia, during the first 9 months of 1997, the gross domestic product (GDP) increased by 5.6% compared with that of the same period in 1996. This increase, was to a great extent, the result of rapid growth in the services sector (share in GDP structure 61.7%), the manufacturing sector (21.0%), and the transport and communications sectors (20.5%). The development of transportation and communications activities was reflected in increases in cargo turnover in the three major ports of Latvia (13.7%), in freight turnover by railway (13.3%), and in oil and oil products transport (9.6%). The increase in manufacturing (4.5%) was achieved mainly owing to the growth in the manufacture of food products. For the first 9 months of the year, only a few sectors showed declines in activity. Among these were the mining and quarrying sector with an 11.3% decrease; the share of this sector in the GDP structure, however, is not significant, being only 0.2% (Central Statistical Bureau of Latvia, 1997, A 5.6% increase in gross domestic product over nine months of 1997, accessed March 5, 1997, at URL http://www.csb.lv/Whatsnew.htm#cc).

In 1997, Latvia's total imports were valued at about $2.7 billion, and exports were valued at about $1.6 billion. The category "Mineral products (including oil and natural gas)" composed 14% of Latvian imports and 1.5% of exports; "Precious metals and metal articles," 8% of imports and 8.5% of exports; "Stone, plaster, and cement articles, ceramic articles, glass and glass articles," 2.3% of imports and 1.7% of exports; and "Precious and semiprecious stones, precious metals, metals coated with precious metals and their manufactures," less than 1% of imports and exports (Interfax Statistical Report, 1998b).

Plans called for the construction of a new loading terminal for crude oil and petroleum products with an annual capacity of 1 million metric tons in the former Navy port of Liepaja. The Latvian company Lat-R won a closed competition for the project, and financing was to be provided by the French bank Societe Generale (Interfax Petroleum Report, 1997b).

At Latvia's Ventspils Nafta oil terminal, construction, which was slated to be completed by the end of 1998, would increase the terminal's capacity from its present 685,000 cubic meters (m^3) storage to 925,000 m^3. The terminal handles shipments of crude oil and petroleum products from Russia. At times of peak operation, Ventspils Nafta has faced a serious shortage of facilities for the loading and storage of crude oil and petroleum products (Interfax Petroleum Report, 1997a).

Plans called for more than 15% of Ventspils Nafta to be privatized in 1997 through the sale of shares for privatization vouchers. In the first round, which was to take place from October 6 to 31, 5 million shares were to be sold. The second round was to start late in December or early in 1998. In total, three rounds of public offers would sell 15.5% of total shares, or more than 16 million shares (Baltic Business Weekly, 1997, Latvia—Second Ventspils Nafta public offer planned soon, No. 95, October 27-November 7, accessed March 4, 1997, at URL http://www.alkhemy.com/latv/LAT.html).

Latvia envisions its major role in the mineral sector as that of a mineral transporter. At the conference planned for April 21, 1998, in Houston, Texas, "Latvia-A Year Round Transport Corridor for the Next Millennium," the Prime Minister of Latvia, as well as the Board of Directors of the Port of Ventspils and the privatized company Ventspils Nafta, were to address the strategic importance of Latvia in international trade across northern Europe and, in particular, as a vital transport route for the export of Russian oil by water. Through its modernization of Ventspils, Latvia plans to increase its significance in the next century as a transport corridor to the states of the former Soviet Union.

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TABLE 1
LATVIA: PRODUCTION OF MINERAL COMMODITIES 1 /

(Metric tons unless otherwise specified)

Commodity	1993	1994	1995	1996	1997
Cement	300,000 e/	244,416	203,786	325,008 r/	246,377
Gypsum	80,000 e/	61,026	80,163	63,888 r/	116,916
Limestone	500,000 e/	392,500	324,000	357,000	372,660
Peat	700,000 e/	646,500	454,700	552,100 r/	554,700
Sand and gravel	80,000 e/	75,553	151,073	324,567 r/	90,551
Steel, crude	300,000	332,000	279,000	293,000 r/	464,529

e/ Estimated. r/ Revised.

1/ Table includes estimates and data based on information available through October 30, 1999.

THE MINERAL INDUSTRY OF

LITHUANIA

By Richard M. Levine

The mining industry of Lithuania extracted peat and industrial minerals, including clays and sand and gravel. Lithuania had been among the leading countries of the former Soviet Union (FSU) in the production of lime, cement, and bricks. During the 1980's, more than 290 enterprises were engaged in the production of industrial minerals, including nitrogenous fertilizer, and more than 240 sand and gravel deposits were being mined. The country's peat production was used in agriculture as compost and litter. Since then, no reports of the development of new mines or enterprises producing industrial minerals have been found, and some facilities may have reduced or stopped production.

According to Lithuania's Finance Minister, preliminary figures for 1997 indicate that it was the most successful year economically since the dissolution of the Soviet Union. The Finance Minister stated that all financial indicators planned for 1997 were achieved or overfulfilled. According to preliminary figures, the growth of the gross domestic product was about 6% (Foreign Broadcast Information Service, radio broadcast [Vilnius Radio], transcription accessed February 5, 1998, at URL http://fbis.fedworld.gov).

Lithuania's foreign trade deficit in the first 10 months of 1997 was 5.341 billion litai (4 litai per US$1.00), an increase of 53% compared with the same period in 1997. Lithuania's main trade partners were Russia (23.8% of exports and 25.2% of imports), Germany (11.7% and 17.7%), Belarus (10.8% and 2.3%), Ukraine (9.0% and 2.1%), and Latvia (8.5% and 1.8%). The Bank of Lithuania's gold reserves stood at $52.7 million at the end of the year (Interfax Statistical Report, 1998).

Lithuania privatized 270 facilities in 1997, equaling about 48% of those included in the privatization program. Privatization in 1997 concerned primarily trade, industry, and construction enterprises. The highest price on the stock market was obtained by the 20.31% Government stake in the Akmene cement plant, which was offered at a starting price of 15 million litai, but was bought by a Norwegian investor for 35.26 million litai. Also, the 32.54% stake in Baltijos Laivu Statykla, a shipyard in the seaport of Klaipeda, offered at 11.3 million litai, was bought by a Danish investor for 11.4 million litai (Interfax Statistical Report, 1998).

The privatization of certain major strategic enterprises will begin in 1998. Lithuania had the Baltic States' only oil refinery at Mazeikiai with a capacity to produce more than 13 million metric tons per year (Mt/yr) of petroleum products. The sale of the oil refinery has been planned for May 1998 and Lithuanian Marine Shipping for July (Interfax Statistical Report, 1998).

For the first 9 months of 1997, the Mazeikiai oil refinery refined 4.1 million metric tons (Mt) of crude oil and was planning to refine 6 Mt by the end of the year. The company's profits were seriously reduced by expenditures on major repairs that lasted for more than a month (Baltic Business Weekly, October, 1997, Lithuania—Repairs reduce Mazeikiai oil's profit, October, 1997, accessed February 5, 1998, at URL http://www.alkhemy.com/latv/LAT.html).

The Ignalina nuclear powerplant, a graphite-moderated pressure-tube reactor, provided a high percentage of Lithuania's capacity to generate electricity. In the first 9 months of 1997 compared with the same period in 1996, generation at Ignalina had fallen by 8.9% because reactors were shut down for repairs. Ignalina planned to generate 14.33 billion kilowatthours of electrical energy in 1997, but reactor shutdowns for repair work caused the facility to fall behind production projections. The first reactor, which was under repair from March until October, resumed operating at its maximum capacity of 1,300 megawatts. The second reactor had been shut down for repairs since October 4 (Baltic Business Weekly, October 6-12, 1997, Lithuania—Ignalina atomic power plant generating less in 1997, accessed February 10, 1998, at URL http://www.alkhemy.com/latv/LAT.html).

The country was a major transshipper of mineral products, mainly through its Baltic seaport of Klaipeda. The Klaipeda oil terminal, Kleipedos nafta, handled nearly 3.6 Mt of petroleum products and liquid fertilizer in 1997, which was a decrease from the more than 4.1 Mt it handled in 1996 (Interfax Statistical Report, 1998). Heavy fuel oil, the transshipping of which was much costlier compared with other products, made up more than 72% of all cargos handled by Klaipeda Oil. Klaipeda Oil has been operating despite ongoing reconstruction at its terminal that began in 1995. All ramps for petroleum product loading were to be reconstructed in November. After the repairs, the Klaipeda terminal should have a projected capacity of 7.1 Mt/yr. It will be able to transship not only heavy and light petroleum products, but also crude oil. The terminal had a capacity of 4.5 Mt/yr before the reconstruction, although at one time it transshipped much larger quantities (Baltic Business Weekly, September 29-October 5, 1997, Klaipeda lowers fuel exports, accessed February 4, 1998, at URL http://www.alkhemy.com/latv/LAT.html).

Construction of an offshore petroleum and petroleum products loading terminal was underway at the Baltic seaport of Butinge. The first stage was completed in 1995. The terminal is to have a designed cargo handling capacity of 8 Mt/yr of crude oil and 2.5 Mt/yr of petroleum products. The terminal was designed with the assistance of the U.S. firm Fluor Daniel Williams Brothers and was being built by Lithuanian companies with credit being extended by the U.S. Export-Import Bank.

Construction of the Butinge offshore terminal has aroused environmental opposition in nearby countries. One of the chief opponents of the project, the Latvian Environmental Protection

Club, was winning international recognition for its opposition to the terminal's construction. The Club's president said his Club had won the support of the Bund fur Umwelt und Naturschut Deutschland's Baltic Sea Program leaders, who promised that their organization would aid the Latvian Club's fight against the terminal. The Latvian Club was supported by environmental protection organizations in Bonn, Bremen, and Munich as well as the Aktion Konferenz Nordsee. The opponents of the project believed that the projected plans for the terminal, which included tankers loading at a distance of 8 kilometers from the coast, could result in damaging oil spills (Baltic Business Weekly, October 13-20, 1997, Lithuania—Latvian greens win int'l support against Butinge, accessed February 5, 1998, at URL http://www.alkhemy.com/latv/LAT.html).

The U.S. steel-processing company Penninox was planning to build a metal-processing plant in the free economic zone of Klaipeda's seaport to produce finished stainless steel products. Penninox is planning to start building the plant in spring 1998. The company reportedly will invest about $50 million in the new plant, which will create about 200 jobs (Newsfile Lithuania Weekly, September 26-October 3, 1997, U.S. steel processing company to invest in Klaipeda free economic zone, accessed April 8, 1998, at URL http://www.waw.pdi.net/~litwaamb/NEWSF503.htm).

Lithuania planned to announce the first open tender for oil-prospecting licenses for the Baltic Sea shelf in 1998-99. Extractable oil deposits in Lithuania's economic zone in the Baltic Sea are estimated to be more than 20 Mt. Lithuania's extractable mainland oil deposits were estimated to be 60 Mt. Oil was being extracted in Lithuania by the joint Swedish-Lithuanian company Genciai Oil, the joint Danish-Lithuanian company Minija Oil, and the state-owned Geonafta Company, which was to be privatized. Oil production totaled 160,000 metric tons (t) in 1997 and should increase to 450,000 t in 1999. To reach that level of production, however, considerable investments will be required in prospecting for new drilling sites, including those in the Baltic Sea (Baltic Business Weekly, October 20-26, 1997, Lithuania—Oil prospecting licenses to be tendered, February 9, 1998, at URL http://www.alkhemy.com/latv/LAT.html).

Geonafta, the Lithuanian state oil prospecting and extraction firm, in 1993 created the Genciai Oil and in 1995 the Minija Oil joint-venture companies to encourage oil prospecting in Lithuania. Genciai Oil was the major oil-extraction company in Lithuania and has been operating profitably since 1994; 50% of it belonged to the Swedish Svenska Petroleum Company. Minija Oil was founded with the Danish DONG Company, which held 50% of its capital; Minija showed profits for the first time in 1997 (Baltic Business Weekly, October 13-20, 1997, Gov't wants Scandinavians out of oil prospecting, accessed February 2, 1998, at URL http://www.alkhemy.com/latv/LAT.html).

The Lithuanian Government wanted to examine the influence of foreign control of its oil industry. The Permanent Control Commission for the Management of Energy Companies and Projects requested the Government to have the State Control Office clarify whether state interests were being violated in the oil sector by the investments of Swedish and Danish firms. Regarding the Scandinavian firms, Lithuania's Vice-Minister for the Economy stated,"We will not propose that they leave, but it is necessary to create adequate conditions for both sides. It should be clear, how many millions each side will contribute and how much will be received" (Baltic Business Weekly, October 13-20, 1997, Gov't wants Scandinavians out of oil prospecting, accessed February 2, 1998, at URL http://www.alkhemy.com/latv/ LAT .html).

Despite questioning foreign involvement in oil development, the Lithuanian Government was calling on foreign investors to participate more actively in the development of the country's petroleum oil storage facilities. At the conference on "Investment and Business Opportunities in Lithuania's Petroleum Sector" held in Klaipeda in October, the Vice-Minister of the Economy stressed the need for foreign investment in the construction of the Butinge Oil import-export terminal. The Vice-Minister said that Canadian and Russian oil companies had expressed interest in becoming partners in the Butinge Oil import-export terminal. The Vice-Minister stated that foreign companies would not necessarily buy new shares issued by Butinge Oil, but rather the Government was considering selling part of its stake in Butinge Oil to foreign investors. The Government had a 70% share in Butinge Oil, but could reduce it to 34%, as permitted by Lithuanian law (Baltic Business Weekly, October 20-26, 1997, Lithuania—Oil prospecting licenses to be tendered, February 2, 1998, at URL http://www.alkhemy.com/latv/LAT.html).

Apart from the Government, the largest investor in Butinge Oil was the German company Preussag Wasser und Rohrtechnik, which had a 21% stake. The total cost of the terminal project was estimated to be more than 260 million litai (Baltic Business Weekly, October 20-26, 1997, Lithuania—GovAEt calls for more active investments in oil sector, accessed February 2, 1998, at URL http://www.alkhemy.com/latv/LAT.html).

As do other Baltic States, Lithuania envisions its future in the mineral industry mainly as a transshipper of minerals, primarily oil, from Russia. Russian experts predict fierce competition among Russian oil companies trying to export crude oil through the Butinge Oil terminal when it is completed. Despite some reports to the contrary, these experts say that the Butinge and Ventspils (Latvian) terminals will not compete because there is enough crude oil on the market for everyone. At the Klaipeda conference, the Director General of the Russian Infotec-Terminal consultancy stated that rivalry among Russian firms for Butinge "Can be felt as early as now. All Russian export terminals have been overflowing, therefore, less crude oil is being extracted than it would be possible to extract. So Butinge is the biggest project in increasing export volumes and is therefore of interest to Russia." The Director General further stated that Russia's current exports are enough to serve as a guarantee that Russia, as well as other FSU countries, will use Lithuania to a greater extent as a gateway to the West (Baltic Business Weekly, October 20-26, 1997, Lithuania—Russians will compete for oil export through Butinge, accessed February 3, 1998, at URL http://www.alkhemy.com/latv/LAT.html).

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TABLE 1
LITHUANIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1997 1/

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity e/
Ammonia, nitrogen content		Jonava nitrogenous fertilizer plant	Jonava	500.
Cement		Akmyantsementas enterprise	Akmyane	2,500.
Clays (for brick production)	cubic meters	Production at 19 deposits with the largest production facilities: The Daugelskoye plant exploiting the Daugelai deposit,	Daugelai	1,500,000 (total for 19 deposits).
Do		The Ignalinskoye plant exploiting the Dinsa deposit	Ignalina region	
Do.		The Tauragskoye enterprise exploiting the Taurage deposit	Taurage region	
Clays (for concrete aggregates)		Krunay deposit	Krunay region in central Lithuania	500.
Clays (for cement)		Saltiniskiai deposit	Saltiniskiai region	2,000.
Limestone		Karpenai deposit for cement production	Karpenia region	8,000.
Peat		Production at 11 eneterprises exploiting 55 deposits Largest eneterprises are: Siauliai exploiting Didisis-Tiryalis and Sulinkiu deposits	Siauliai region	350.
Do.		Ezherelskoye exploiting Ezherelis and Pales deposits	Ezherelis region	400.
Do.		Ionovskoye exploiting Paraistis and Disisis-Raystas deposits	Paraistis region	300.
Do.		Baltoyi-Bokeskoye exploiting Baltoyi and Vokeskoye deposits	Baltoyi-Boke region	300.
Petroleum. crude		Geonafta Geniciai Oil Minja Oil	NA NA NA	NA. NA. NA.
Petroleum, refined		Mazeikiai petroleum refinery	Mazeikiai	13,000.
Sand and gravel	million cubic meters	246 deposits under exploitation. Largest enterprises: Trakaijskoye association exploiting Serapinshkes deposits	Trakai region	20 (total for 246 deposits).
Do.	do.	Rizgonskiy plant and Yurbarkskiy plant exploiting Rizgonys and Kalnenay deposits	Rizgonys region	
Sand (for glass)		Anyksciai deposit	Anyksciai	150.

e/ Estimated NA Not available.

1/ Production may have been curtailed or ceased at a number of enterprises listed as mining industrial minerals as current information has not been available to update enterprise listings.

THE MINERAL INDUSTRY OF

MACEDONIA

By Walter G. Steblez

The Republic of Macedonia was a major producer of minerals in the former Yugoslavia. In 1990, the country's output of major minerals, as a percentage of total output for the former Yugoslavia, amounted to 12.3% for copper ore; 36.9% for lead and zinc ore; smelter and refined lead, 25.6% and 26.7%, respectively; and secondary smelter zinc and primary and secondary refined zinc, 100% and 45.3%, respectively. Additionally, steel (electric furnace) production was 16% of total production. With respect to industrial minerals, Macedonia's production of bentonite, dolomite, gypsum, and pumice in 1990 amounted to 65.3%, 58.1%, 10.2%, and 48.7%, respectively, of the former Yugoslavia's total production. Although Macedonia was not directly involved in warfare in other regions of the former Yugoslavia, the country's economy and minerals industry were impacted negatively by the severance of traditional intra-Yugoslavian markets and the international embargoes placed on the Republics involved in the conflict. Additionally, a prolonged lack of international recognition, owing to a dispute with Greece about the name "Macedonia," resulted in the country's virtual commercial isolation for several years. Compared with output levels achieved in 1990, production of selected mineral commodities in 1997 were as follows: aluminum, 73%; ferroalloys, 94%; steel, 36%, lead and zinc ore, 63%; and cement, 78%.

In 1996 and 1997, Macedonia's economy showed some improvement compared with its performance during the preceding 3 years. The country's gross domestic product (GDP) in 1996 increased slightly (0.8%) compared with that of 1995, industrial production rose by 3.2%. In 1997, Macedonia's GDP increased by about 1.5%; industrial production in the first 6-month period of 1997 increased by as much as 2% and 3% (National Bank of Macedonia, 1998).

By the beginning of 1997, more than 95% of Macedonia's enterprises were privately owned. Mineral-producing and mineral-processing enterprises that were state-owned and state-operated in 1997, such as Jugohrom Hemijsko-Elektrometalurski Kombinat (ferroalloys), Fenimak (ferronickel), Okta (oil refinery), and Rudnici IZeljezarnica Skopje (steel), were in the process of being denationalized and were seeking buyers and foreign partners. *(See table 2.)* In 1997, Samsung Corporation of the Republic of Korea started negotiations with the Government of Macedonia for the purchase of Fenimak. To ensure the success of the negotiations, Samsung proposed to invest $40 million during 1998-99 to raise Fenimak's production capacity from 5,200 metric tons per year (t/yr) to 11,165 t/yr of ferronickel (U.S. Embassy, Skopje, Macedonia, 1997). At yearend, Balkan Steel International, a Paris-based trading company, reached an agreement with the Government allowing it to manage the hot-strip mill at Rudnici IZeljezarnica Skopje (Skopje) for 1 year starting in January 1998. According to a Government spokesperson, Balkan Steel's management of the strip mill would help prepare the steel producer for full privatization and would supply the Skopje mill with raw materials, as well as cover losses and pay salaries. Balkan Steel International indicated that the mill would produce regular and higher grade steels and would sell to anyone with good price offers. Late in the year, the Swiss trading firm, Duferco, purchased a 54% share in Skopje's electric arc furnace and plate mill (Metal Bulletin, 1998).

Macedonia was entirely landlocked and possessed neither a merchant marine fleet nor pipelines for carriage of natural gas and petroleum. The country's inland transportation and communication system consisted of railroads, highways, and waterways. Although data on the total lengths of railroads and inland waterway systems had not been fully reported, the highway and road system consisted of 10,591 kilometers (km) of paved, gravel, and earth-surfaced road, of which 5,091 km was paved, 1,404 km was gravel, and 4,096 km was earth surfaced.

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TABLE 1
MACEDONIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997
METALS						
Aluminum: Metal, ingot, primary and secondary		2,000	5,000 3/	3,700 3/	4,000	4,000
Cadmium, smelter output	kilograms	100	100	100	100	100
Chromite:						
Ore, gross weight		5,000	5,000	5,000	5,000	5,000
Concentrate (produced largely from imported ores)		3,000	3,000	3,000	3,000	3,000
Copper: Mine and concentrator output:						
Ore, gross weight	thousand tons	2,500	2,000	2,000	2,000	2,000
Cu content of ore		7,224 3/	7,534 3/	7,140 3/	7,000	6,500
Concentrate, gross weight		25,000	20,000	20,000	20,000	20,000
Gold	kilograms	680	640	650	650	650
Iron and steel:						
Iron ore:						
Gross weight	thousand tons	20,000	20,000	20,000	20,000	20,000
Fe content of ore		1,000	1,000	1,000	1,000	1,000
Concentrate		15,000	15,000	15,000	15,000	15,000
Pellets		10,000	10,000	10,000	10,000	10,000
Agglomerate		5,000	5,000	5,000	5,000	5,000
Metal:						
Ferroalloys:						
Ferrochromium, low C		4,376 r/ 3/	3,166 r/ 3/	3,765 r/ 3/	3,780 3/	460 3/
Ferrosilicon		20,000	58,740 3/	57,200 3/	57,220 3/	55,000
Silicon		1,000	1,000	1,000	1,000	1,000
Total		25,376 3/	62,906 3/	61,965 3/	62,000	59,500
Pig iron		20,000	20,000	20,000	20,000	20,000
Steel, crude:						
From oxygen converters		37,000	30,000	30,000	30,000	30,000
From electric furnaces		100,000	55,000	60,000	60,000	60,000
Total		137,000 3/	85,000 3/	90,000	90,000	90,000
Semimanufactures		20,000	91,000	65,000	65,000	60,000
Lead:						
Mine output, ore gross weight (Pb, Zn ore)		400,000	900,000	900,000	846,244 r/ 3/	850,000
Concentrate, gross weight		8,000	17,000	17,000	16,885 3/	17,000
Smelter, primary and secondary		10,000	22,000	23,000	23,000	20,000
Refined, primary and secondary		36,080 r/ 3/	30,464 r/ 3/	30,000 r/	30,000 r/	25,000
Nickel: Metal, Ni content of FeNi		4,493 r/ 3/	3,980 r/ 3/	3,500	3,000	3,000
Silver	kilograms	24,117 r/ 3/	22,303 r/ 3/	25,000	20,000 r/	20,000
Zinc:						
Concentrate		15,000	15,000	15,000	15,017 3/	15,000
Metal:						
Zn, refined, primary and secondary:						
Smelter		7,000	7,000	7,000	7,000	7,000
Electrolytic		22,611 r/ 3/	24,205 r/ 3/	21,335 r/ 3/	20,000 r/	20,000
INDUSTRIAL MINERALS						
Cement 3/	thousand tons	499	486	524	491 r/	500
Clays, bentonite 3/		35,000	30,000	30,000	30,000	30,000
Diatomite		5,000	5,000	5,000	5,000	5,000
Feldspar		15,000	15,000	15,000	15,000	15,000
Gypsum:						
Crude		30,000	25,000	25,000	25,000	25,000
Calcined		7,000	5,000	5,000	5,000	5,000
Lime		20,000	20,000	20,000	20,000	20,000
Pumice and related materials, volcanic tuff		75,000	75,000	75,000	75,000	100,000
Sand and gravel, excluding glass sand	thousand cubic meters	130	130	130	130	130
Stone, excluding quartz and quartzite, dimension, crude:						
Ornamental	square meters	200,000	266,700 3/	192,300 3/	186,783 r/3/	190,000
Crushed and brown, n.e.s.	thousand cubic meters	400	400	400	400	400
Other	cubic meters	10,000	13,100 3/	12,100 3/	10,000	10,000
Sulfur, byproduct of metallurgy	thousand tons	6	6	6	6	6
Talc:						
Crude		10,000	10,000	10,000	10,000	10,000
Washed		7,000	7,000	7,000	7,000	7,000

See footnotes at end of table.

TABLE 1--Continued
MACEDONIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997
MINERAL FUELS AND RELATED MATERIALS						
Lignite	thousand tons	7,706 3/	6,830 3/	7,000	6,500	6,500
Petroleum refinery products	thousand 42-gallon barrels	8,000	8,000	8,000	8,000	8,000

e/ Estimated. r/ Revised.

1/ Table includes data available through June 1998.

2/ In addition to commodities listed, common clay and diatomite also are produced, but available information was inadequate to make reliable estimates of output levels.

3/ Reported figure.

TABLE 2
MACEDONIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity e/
Cement	Azbestcementa "Usje" Preduzece za Proizvodnju Cementa	Plant at Skopje	2,190
Chromite, concentrate	Jugohrom, Hemijsko-Elektrometakurski Kombinat	Concentrator at Radusa	150
Copper ore	Bucim, Rabotna Organizacija za Rudarstvo i Metalurgija za Baker	Mine and mill at Bucim, near Radovis	7,000
Ferroalloys	Jugohrom, Hemijsko-Elektrometalurski Kombinat	Plant at Jegunovce	80
Iron ore	Skopje, Rudnici i Zeljezarnica Skopje	Mines at Tajmiste, Demir Hisar, and Damjan	1,000
Lead-zinc ore	Prepobotuvacki, Kombinat Zletovo-Sasa: Sase, Rudnici za Olovo i Cink	Mine and mill near Kamenica	300
Do.	Zletovo, Rudnici za Olovo i Cink	Mine and mill near Probistip	700
Lead metal	Zletovo, Topilnica za Cink i Olovo	Imperial smelter at Titov Veles	40
Do.	do.	Refinery at Titov Veles	40
Nickel:			
Ore	Feni-Rudnici i Industrija za Nikel, Celik i Antimon	Mine and opencast mine near Kavadarci	2,300
Metal 1/	do.	Ferronickel plant at Kavadarci	161
Pig iron	Skopje, Rudnici i Zeljezarnica Skopje	5 Elkem electric furances at Skopje	430
Steel, crude	do.	Plant at Skopje	980
Zinc metal	Zletovo, Topilnica za Cink i Olovo	Imperial Smelter plant and refinery at Titov Veles	65

1/ Nickel in ferronickel.

THE MINERAL INDUSTRY OF

MALTA

By Harold R. Newman

Malta's mineral industry rested mainly on trade and the storage of crude oil and refinery products, as well as other nonfuel mineral commodities. The mineral industry, consisting mainly of limestone and salt production, contributed less than 0.5% to the gross national product. The transshipment and reexport of goods was significant to Malta's economy. For more-extensive coverage of the mineral industry of Malta, see the 1996 Minerals Yearbook, International Review of Europe and Central Eurasia, Volume III.

TABLE 1
MALTA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES 1/

Commodity 2/		1993	1994	1995	1996	1997
Limestone	thousand metric tons	2,200	2,200	2,000	2,000	2,000
Salt	metric tons	30	30	30	30	30

1/ Table includes data available through March 1998.

2/ In addition to listed commodities, a small amount of cement, fertilizer, lime, and plaster is produced, but available information is inadequate to make reliable estimates of output levels.

THE MINERAL INDUSTRY OF

MOLDOVA

By Richard M. Levine

Moldova's small mineral industry was primarily engaged in the mining and production of industrial minerals and products, including cement, dimension stone, gypsum, limestone, and sand and gravel. As of 1996, the sector entitled "mining of quarries and sand pits" accounted for 0.8% of Moldova's total industrial output (Ministry of Economy and Reforms, Moldovan industry trends, accessed March 1, 1999, at URL http://www.moldova.md/DEPART/DEPSTAT/1996/EN/18.htm). Moldova also had a steel minimill in Rybnitsa with the capacity to produce 800,000 metric tons per year of crude steel. More than 90% of the country's industrial raw materials and more than 98% of its mineral fuels were imported from Russia.

In 1997, Moldova's gross domestic product (GDP) increased by 1.3% compared with that of 1996. It was the first positive rate for the GDP in the last 7 years and was attributed to a particularly good year in agriculture. Since 1992, economic activity in Moldova has steadily declined because of many factors, including increasing prices for imported energy resources, upon which Moldova was almost totally dependent. Also, the conflict in the separatist region of Transnistria complicated the country's transition to a market economy. Transnistria, despite its small size (about 12% of the territory and 17% of the population of the country), is an economically important region; before the disintegration of the Soviet Union, it accounted for more than one-fourth of the republic's GDP and 35% of its total industrial output (Ministry of Economy and Reforms, Moldovan industry trends, accessed March 1, 1999, at URL http://www.moldova.md/DEPART/DEPSTAT/1996/EN/18.htm). Moldova's major industrial facility, the minimill in Rybnitsa, is in the Transnistria region.

In the country's economic statistical reporting, output from Transnistria is no longer accrued in the national accounts. In the tables for this report, which were derived from Moldovan reporting, post-1993 data from the Transnistria region is not included. Steel production data, which was derived from other sources, does, however, include the minimill in Transnistria.

Major Sources of Information

Ministry of Economy and Reforms
1 Piata Marii Adunari Nationale
Chisinau, 2033
Moldova
Telephone: 373-2-23-32-67
Fax: 373-2-24-40-64
Department of Foreign Economic Relations
1 Piata Marii Adunari Nationale
Chisinau, 2033
Moldova
Telephone: 373-2-23-35-18
Fax: 373-2-23-40-46
Development and Foreign Investment Agency
1 Piata Marii Adunari Nationale
Chisinau, 2033
Moldova
Telephone: 373-2-23-36-56
Fax: 373-2-23-40-46
Ministry of Industry and Trade
69 Stefan cel Marc Blvd.
Chisinau, 2001
Moldova
Telephone: 373-2-23-35-56
Fax: 373-2-22-73-46; 22-24-73
Department of Customs
65 Columna St.
Chisinau, 2001
Moldova
Telephone: 373-2-54-94-60
Fax: 373-2-26-30-61
Department of the Environment and Ecology
73 Stefan cel Mare Blvd.
Chisinau, 2001
Moldova
Telephone: 373-2-22-51-44
Fax: 373-2-23-38-06
Department of Statistics
24 Stefan cel Mare Blvd.
Chisinau, 2001
Moldova
Telephone: 373-2-22-16-14
Fax: 373-26-11-19

TABLE 1
MOLDOVA: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

	1993	1994	1995	1996	1997
Cement	100,000	40,000 r/	50,000	40,000	122,000
Gypsum	25,000 e/ r/	14,600 r/	13,600	12,700	20,000 e/
Lime	50,000 e/	15,900	10,800	18,800	20,000 e/
Peat	700,000 e/	646,500	454,700	462,700	475,000 e/
Sand and gravel	80,000 e/	75,553	151,073	25,753	30,000 e/
Steel, crude	604,000	633,000 r/	663,000	630,000	811,000

e/ Estimated. r/ Revised.

1/ Table includes estimates and data based on information available through March 17, 1999.

2/ Beginning in 1994, data, with the exception of crude steel, exclude production from Transnistria.

TABLE 2
MOLDOVA: MINERAL TRADE BY COMMODITY CATEGORY 1/

(In million lei and category as a percent of total exports and imports) 2/

Exports

Commodity category	1994		1995		1996		1997		
	Million lei	% of 100%	Million lei	% of 100%	Million lei	% of 100%	Million lei	% of 100% to CIS 3/	% of 100% to non-CIS
Ferrous and nonferrous metals	77.4	3.3	145.5	4.3	64	1.7	NA	NA	NA
Mineral products	61.1	2.6	37.6	1.1	11.9	0.3	NA	0.3	0.3
Pearls, precious stone and metals	3.9	0.2	10.1	0.3	5.2	0.1	NA	NA	NA

Imports

Commodity group	1994		1995		1996		1997		
	Million lei	% of 100%	Million lei	% of 100%	Million lei	% of 100%	Million lei	% of 100% from CIS	% of 100% from non-CIS
Ferrous and nonferrous metals	85.4	3.2	152.6	4	234.7	4.7	NA	NA	NA
Mineral products	1,489.1	55.3	1,756.1	46.4	1,826.1	36.8	NA	61	7.3
Pearls, precious stones and metals	3.3	0.1	10.4	0.3	16.7	0.3	NA	NA	NA

NA Not available.

1/ Data exclude trade from Transnistria.

2/ The exchange rate for the lei averaged 4.6 lei per US$1.00 in 1996 and 4.62 lei per US$1.00 in 1997.

Source: Ministry of Economy and Reforms of the Republic of Moldova, Moldovan economic trends, foreign trade, accessed March 17, 1998, at URL http://www.moldova.md/ECON/met.htm.

3/ CIS--Commonwealth of Independent States.

THE MINERAL INDUSTRY OF

THE NETHERLANDS

By Harold R. Newman

In terms of world production, the Netherlands was a modest producer of metallic, nonmetallic minerals, and mineral products; it was very important as a regional producer of natural gas and petroleum for the European market and plays a major role as a transshipment center for mineral materials entering and leaving continental Europe.

Rotterdam, the world's largest container port and a major European transportation hub, remained extremely important as a shipping and storage center. With the ever-expanding inland transportation systems, goods entering or leaving Rotterdam originated in or were destined for almost anywhere in continental Europe. The facilities at Rotterdam and surrounding area, however, could not accommodate a significant increase in traffic without upgrading and expansion.

Environmental policy in the Netherlands is the responsibility of the Ministry of Housing, Planning, and the Environment, and protecting and upgrading the quality of the environment is of high priority to the citizens of the Netherlands. In addition to protecting the environment, the Dutch Government was also concerned with remedying the practices of the past. One interesting feature of Dutch environmental policy was the use of "covenants," which were voluntary agreements between industry and Government, and sometimes other organizations, to work together to achieve certain environmental goals, such as the reduction of waste.

Production of mineral commodities generally remained the same or dropped slightly during 1997. The high cost of social benefits contributed to the production costs of Dutch products, thus making them less competitive on the world market. The Government had reduced its role in the economy since the 1980's, and privatization continued with little debate or opposition. Nevertheless, the state dominated the energy sector and played a large role in transport, chemicals, aviation, telecommunications, and steel. *(See table 1.)*

The Netherlands was one of the top trading countries in the world and depended heavily on foreign trade. The country maintained a commitment to an open market and free trade. It was ranked fifth in exports of goods and services to the United States and eighth in imports of goods and services from the United States. Germany was the Netherlands main trading partner (U.S. Department of State, January 1998, 1997 Economic policy and trade practices, accessed April 15, 1998, at URL http://www.state.gov/www/issues/economic/trade_reports/europe_canada97/netherlands97.html).

The only mining operations left in the Netherlands in 1997 were the extraction of peat, salt, and sand and gravel. The metal-processing sector relied almost exclusively on imported raw materials of concentrates of ores and scrap. *(See table 2.)*

Production of primary aluminum in the Netherlands by Hoogovens Aluminium BV had been declining steadily for the past few years, while the growth of the secondary aluminum industry had been increasing. The production of secondary aluminum consumed about 5% of the energy required to produce primary aluminum.

Hoogovens continued to investigate the possibility of building its own powerplant to serve its aluminum and steel operations. An earlier study by the company had indicated that the organization could save as much as 20% on its energy costs if it were to build a 1,000-megawatt powerplant. This would be equivalent to 6% of the country's electricity capacity.

The Steel Division of the Hoogovens Group, Hoogovens IJmuiden BV, was Europe's sixth largest steel producer. As a result of the company's reorganization plan that took effect in mid-1995, the steel division was divided into five separate business-oriented organizations, each responsible for its own financial results. In addition to the marketing, sales, and production units, a product/market unit was created to focus more attention on customer-driven innovation. To increase the international depth of the market, an International Business Development directorate was set up during this reorganization to build up sustainable positions on growth markets outside of Europe (Hoogovens Ijmuiden, January 1997, untitled, accessed May 28, 1998, at URL http://www.stw.nl/jv96/gebr/hoogovens.html).

After the Nederlandse Aardolie Mattschappij discovered one of the largest gasfields in the world in the north of the Netherlands in 1959, the decision was taken to drill for natural gas and petroleum in the North Sea as well. Natural gas has become the most important mineral fuel produced in the Netherlands and was produced from 30 offshore facilities in the North Sea and 20 onshore facilities. Companies are now allowed to deplete gasfields over a period of 10 years instead of the previous 14 years and at a maximum load factor of 90% instead of the previous 67%. In addition to domestic consumption, the gas was exported and provided the equivalent of more than US$4 billion each year in export sales (Netherlands Foreign Trade Agency, January 1998, The Netherlands and the European Union, 1997, accessed May 28, 1998, at URL http://www.hollandtrade.com/NLEU.htm).

The large Slochteren gasfield in Groning Province was one of the world's largest producing natural gas fields. The Netherlands' total proven natural gas reserves, including mainland and North Sea continental shelf, has been estimated to be 1.2 trillion cubic meters, of which about 80% is at Slochteren (Department of State, April 1996, The Netherlands, April 1996, DOS Publication 7967, accessed May 27, 1997, at URL:gopher://dosfan.lib.uic.edu/).

Major Sources of Information

Geological Survey of the Netherlands
Richard Holkade, 10
2000 AD Haarlem
The Netherlands

Ministry of Economic Affairs
2500 EC The Hague
The Netherlands

TABLE 1
NETHERLANDS: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/		1993	1994	1995	1996	1997 e/
METALS						
Aluminum metal:						
Primary		231,841	219,382	215,600	227,027	231,000
Secondary e/		150,000 3/	175,300	191,500	150,000 r/	150,400 4/
Cadmium metal, primary		526	307 r/	603 r/	603 r/	753 4/
Iron and steel:						
Ore, sintered (from imported ore)		4,000,000 e/	3,021,500	4,246,400	4,250,000 e/	4,250,000
Metal:						
Pig iron, including blast-furnace ferroalloys (if any)		5,404,000	5,443,400	5,646,500	5,545,000	5,804,000 4/
Steel:						
Crude		6,001,000	6,174,000	6,409,000	6,325,000 r/	6,640,000 4/
Semimanufactures		5,812,000	5,948,000	5,500,000 e/	4,810,000 r/	5,175,000 4/
Lead, metal, refined, secondary		24,200	24,500 r/	20,200 r/	22,000 r/ e/	19,500
Tin, metal, secondary		200 r/	--	--	--	--
Zinc, metal, primary		206,700	212,600	206,300	207,100 r/	201,100 4/
INDUSTRIAL MINERALS						
Cement, hydraulic e/		3,400,000	3,400,000	3,400,000	3,300,000	3,300,000
Magnesium compounds: e/						
Chloride		125,000	140,000	125,000	125,000	125,000
Oxide		90,000	100,000	100,000	100,000	100,000
Nitrogen, N content of ammonia e/	thousand tons	2,472 4/	2,500	2,500	2,500	2,500
Salt, all types e/	do.	3,500	3,500	4,976 4/	5,530 4/	5,500
Sand, industrial	do.	20,000 e/	25,006	23,159	24,000 r/ e/	24,000
Sodium compounds, n.e.s.: e/						
Carbonate, synthetic		400,000	400,000	400,000	400,000	400,000
Sulfate:						
Natural		20,000	20,000	20,000	20,000	20,000
Synthetic		15,000	15,000	15,000	15,000	15,000
Sulfur: e/						
Elemental byproduct:						
Of metallurgy		125,000	125,000	125,000	150,000	150,000
Of petroleum and natural gas		290,000	300,000	300,000	150,000	137,600
Total		415,000	425,000	425,000	300,000 r/	287,600
Sulfuric acid, 100% H2SO4		1,150,000	1,250,000	1,250,000 e/	1,250,000 e/	1,250,000
MINERAL FUELS AND RELATED MATERIALS						
Carbon black e/		100,000	110,000	100,000	100,000	100,000
Coke, metallurgical e/		2,900,000	2,750,000	2,800,000	2,800,000	2,800,000
Gas:						
Manufactured e/	llion cubic meters	9,500	10,000	10,000	10,000	10,000
Natural:						
Gross	do.	84,005	78,400	78,350	89,700	88,000
Marketed e/	do.	83,000	77,400	78,000	86,000	86,000
Natural gas liquids e/	42-gallon barrels	170,000	170,000	170,000	170,000	170,000
Peat, agricultural e/		300,000	300,000	300,000	300,000	300,000
Petroleum:						
Crude	42-gallon barrels	18,947	25,298	24,466 r/	21,086 r/	21,000
Refinery products: e/						
Liquefied petroleum gas	do.	--	36,100 4/	36,000	36,000	36,000
Mineral jelly and wax	do.	600	600	600	600	600
Gasoline, motor	do.	74,000	75,000	75,000	75,000	75,000
Naphtha and white spirit	do.	100,000 4/	84,200 4/	85,000	85,000	85,000
Jet fuel	do.	39,000 4/	44,200 4/	40,000	40,000	40,000
Kerosene	do.	--	1,520 4/	1,600	1,600	1,600
Refinery gas	do.	21,200	22,000	20,000	20,000	20,000
Lubricants	do.	3,500	3,750	3,800	3,800	3,800
Residual fuel oil	do.	99,100 4/	84,400 4/	85,000	85,000	85,000
Bitumen	do.	4,400	4,400	4,500	4,500	4,500
Unspecified	do.	25,000	25,000	25,000	25,000 r/	25,000
Total	do.	366,800	381,170	376,500	376,500	376,500

e/ Estimated. r/ Revised.

1/ Table includes data available through April 1998.

2/ In addition to the commodities listed, the Netherlands produced construction materials, such as sand and gravel, but output was not reported, and no basis exists to make reliable estimates of output.

3/ Sales.

4/ Reported figure.

TABLE 2
NETHERLANDS: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facility	Annual capacity
Aluminum, primary		Hoogovens Aluminium BV	Smelter at Delfzijl	219
Do.		Pechiney Nederland BV	Smelter at Vlissingen	178
Cadmium	tons	Budelco BV (Australian Overseas Smelting Pty. Ltd, 50%; Kempensche Zinkmaatschappij Zincs de la Campine BV, 50%)	Plant at Budel-Dorplein	650
Cement		ENCI Nederland BV (Eerste Nederlandse Cement Industrie NV)	10 plants at Maastrict	2,700
Do.		Cementfabriek IJmuiden BV	3 plants at IJmuiden	1,600
Do.		Cementfabriek Rozenburg BV	2 plants at Rozenburg	920
Lead		Hollandse Metallurgische Industrie Billiton BV	Electrolytic plant at Arnhem	35
Do.		Billiton Witmetaal BV	Electrolytic plant at Naarden	6
Magnesia		Billiton Refractories BV	Plant at Veendam	100
Do.		MAF Magnesite BV	Plant at Vlaardingen	40
Natural gas	million cubic meters per day	Nederlandse Aardolie Maatschappij BV (NAM)	Groningen, Leeuwarden, Assen, and other onshore gasfields and several offshore wells in the North Sea	225
Petroleum, crude	barrels per day	AMOCO, CONOCO, and UNOCAL	766 wells (204 producing) including North Sea fields: Haven, Helder, Helm, Hoorn, Kotter, Logger, and Rijn	83,500 (63,000)
Do.	do.	NAM	Onshore fields: Berkel, DeLier, Ijselmonde, Meerkapelle, Pernis, West, Pinacke, Rotterdam, Schoonebeck, Werkendam, and Zoetemeer	(20,500)
Refineries		6 companies, of which the major ones are:		1,230,500
Do.	do.	Netherlands Refining Co.	Refinery at Rotterdam	(446,000)
Do.	do.	Shell Nederland Raffinaderij BV	Refinery at Pernis	(374,000)
Do.	do.	Esso Nederland BV	Refinery at Rotterdam	(175,000)
Do.	do.	Total Raffinaderij Nederland NV	Refinery at Vlissingen	(150,000)
Salt		Akzo Salt and Basic Chemicals BV	Mines at:	4,000
Do.		do.	Hengelo	(2,000)
Do.		do.	Delfzijl	(2,000)
Sodium:				
Carbonate, synthetic		do.	Plant at Delfzijl	380
Sulfate, synthetic		do.	do.	600
Steel		Hoogovens IJmuiden BV	Plant at IJmuiden	6,100
Zinc		Budel Zinc BV (Pasminco Europe BV)	Plant at Budel-Dorplein	215

THE MINERAL INDUSTRY OF

NORWAY

By Harold R. Newman

Since the discovery of North Sea petroleum in the late 1960's, petroleum production has become the most important mineral industry activity in Norway. *(See table 1.)* It has been the largest mineral contributor to the gross national product (GNP), accounting for 15.6% GNP and representing about 38% of total export earnings in 1997.

The Norwegian economy remained dependent on foreign trade from which more than one-half of the GNP was derived. About 75% of the minerals consumed were imported. Petroleum was the most significant mineral commodity export, followed by metals and industrial minerals.

Sand, gravel, and aggregate deposits were some of Norway's most important mineral materials. The Norwegian Geological Survey (NGU) established a Gravel and Aggregate Database containing information on all the country's deposits of sand, gravel, and aggregates. This data base contains information on each deposit's location, composition, volume, quality, and operating status (Norwegian Geological Survey, 1997, Mineral resources, accessed May 1998, at URL http://www.ngu.no/eng/fagomraader/mineralres.htm).

Production of metallic ores has fallen gradually for many years as existing mines were being depleted and exhausted mines were not being replaced. This decline of metallic mineral output has been partially offset by increased production of industrial minerals.

The Norwegian Government's involvement in the mineral industry remained substantial, especially in offshore hydrocarbon production. Through state-owned Den Norske Stats Oljeselskap A/S, the Government continued to control all hydrocarbon production and refining. The rest of the mineral industry was dominated by Elkem A/S and Norsk Hydro A/S. *(See table 2.)*

The Government of Norway and Norsk Hydro signed a 50-year agreement that allows the company to make use of the water, considered to be state property, in four of its hydropower plants, in return for about $200 million. These four plants produce about 3 billion kilowatt hours per year of electricity. If approved by the Norwegian Parliament, the agreement will provide some predictability for long-term power costs and will facilitate Norsk Hydro's expansion plan to its Årdal aluminum smelter's capacity by 50,000 metric tons per year (t/yr) to more than 240,000 t/yr.

The first phase of the expansion, expected to take a year and to cost an estimated $42 million, would involve installing 26 new reduction cells and a new gas cleaning system and raising rectifier capacity in the existing potroom. The second phase, expected to take from 2 to 3 years and to cost an estimated $146 million, would replace the older Søderberg technology with prebaked anode cell technology in a second potroom (Norsk Hydro, July 1997, 3rd quarter report, accessed August 11, 1997, at URL http://www.hydro.com/konsem/finance/ quarterly/1997/eng/lm/html).

Elkem Aluminum ANS operated two primary aluminum smelters with a combined capacity of about 250,000 t/yr in Farsund and Mosjoen. Elkem has begun a project to reduce air and water pollution at an estimated cost of $36 million at its Farsund plant. This undertaking was scheduled to be completed by 1998.

Two gold exploration projects were begun by Viking Gold Corp. and Consolidated Logan Mines Ltd. Viking was exploring the Bindal Gold project, which includes three properties, Kolsvik, Reppen, and Royskattendalen. The deposit occurs in early Silurian-age rocks of the Caledonides and is located 300 kilometers (km) north of Trondheim. The project comprises 185 claims covering 4,630 hectares. To date 9 exploration adits and 49 diamond drill holes, for a total of 4,048 meters have been completed. Viking has indicated estimated resources of 2 million tons grading 8 grams per ton (g/t) at Kolsvik and 800,000 metric tons (t) grading 6 g/t at Reppen. Royskattdalen is considered to be an exploration target in a similar host environment (Viking Gold Corp., 1997, news release, accessed August 1997 at URL http://www.infomine.com/vikinggold/bindal.html).

The Kells Creek gold prospect of Consolidated Logan Mines Ltd. consists of 12 claims covering about 3.5 square kilometers, near Oppdal, within Precambrian gneisses of the Highlands of central Norway. There was interest in the area after several blocks of mineralized gneiss containing chalcopyrite and copper stains, which proved to carry gold values, were located in 1992.

The geologic history of the area has been interpreted as providing a setting for precious- and base-metal mineralization. A hydrothermal system deposited ores and was subsequently metamorphosed. The system deposited copper, followed by gold, in faults, leach cavities, and veins. The Caledonian Orogeny likely created open-space fractures. Remobilization and introduction of gold into brecciated rock may have taken place during metamorphism.

Logan has completed diamond drilling of 14 geophysical anomalies that had been outlined by the NGU. The company reported the discovery of minor gold values. The next stage of exploration at Kells Crek will focus on four drift-covered zones through a program of overburden drilling, hand trenching, and soil surveying (Consolidated Logan Mines Ltd., 1997, news release, accessed August 14, 1997, at URL http://www.infomines.com/logan/kells html).

A/S Sydvaranger was a major producer of iron ore, with most of the production exported to Germany and the United Kingdom. The Rana Gruber Mine was preparing for low-cost underground mining as the open pit areas were expected to be exhausted in about 2 years.

NGU has analyzed a 2-millimeter, 0.07-carat diamond that was found in stream sediments in Finnmark County in northern Norway. This was the first verified diamond discovery in Norway and confirmed geologic theories that diamonds could exist in the Finnmark County area. An exploration company, Mallmikaivos Oy, is searching for diamonds in Finland. It is a subsidiary of the Australian company Ashton Mining Ltd., which has exploration rights in Finnmark County (Norwegian Geological Survey, January 1997, Diamond discovered in Finmark, accessed August 14, 1997, at URL http://www.ngu.no/NGU/eng/presseng/diamt.htm).

Titania A/S was one of two hardrock ilmenite producers in the world. The mine in Tellnes averaged about 2.5 Mt of crude ore from which 700,000 to 850,000 t of concentrate was produced with a 44.7% titanium oxide content and small amounts of magnetite and pyrite concentrate.

Some of the world's largest resources of high-quality olivine are in the Sunnmøre-Nordfjord area on the southwestern coast of Norway. With plants at Åheim and Stranda, A/S Olivin was the world's leading producer of olivine products. The 2-million-metric-ton-per-year capacity open pit mine was 4 km from the plant and the port. The olivine ore was transported in a tunnel by conveyor belt to the processing plant.

Production of dimension stone has been steadily increasing as the industry, comprised of many small firms, has been expanding. The most sought after stone was larvikite, a syenite with a feldspar lamellar structure that gives it a special luster. Also, banded dolomite from the Fauske area was highly regarded.

Offshore hydrocarbon production was expected to remain the principal economic activity for the next several decades. Norway produced an average of about 3.02 million barrels per day of crude oil and was ranked seventh in world production. The country maintained its position as the world's second largest oil-exporting country. In 1997, 47 exploration wells, including 35 wildcats and 12 appraisal wells, were completed or temporarily abandoned on the Norwegian continental shelf. Of these, 32 were in the North Sea, and 15 were in the Norwegian Sea (Royal Ministry of Petroleum and Energy, 1998).

The Government approved the development of the Jotun Troll West Gasprovince, the Oseberg South, the Yme Gamma Southeast, and the Eldfisk water injection projects. Investment in exploration, field development, and pipeline transportation projects totaled about $7.2 billion in 1997 (Royal Ministry of Petroleum and Energy, 1998).

To counter an anticipated decline in production during the next decade, the Government has been encouraging the discovery of new resources. Exploration has been focused on finding resources near existing infrastructures. In the coming years, greater emphasis will be placed on areas that are currently unexplored. Readily available hydroelectric power and ice-free ports facilitated the growth of energy-intensive industries, namely production of aluminum, ferroalloys, magnesium, and silicon metal.

Reference Cited

Royal Ministry of Petroleum and Energy, 1998, Norwegian petroleum activity 98: Royal Ministry of Petroleum and Energy, 144 p.

Major Sources of Information

Norwegian Geological Survey
P.O. Box 3006 Lade
7002 Tronheim, Norway
Royal Ministry of Petroleum and Energy
P.O. Box 8148 Dep
0033 Oslo, Norway

TABLE 1
NORWAY: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1993	1994	1995	1996	1997 e/
METALS					
Aluminum:					
Primary	887,461	856,967	846,794	863,002 r/	918,558 2/
Secondary	51,987	47,994	55,685	46,978	59,000
Cadmium, smelter	213	288	317	274	324 2/
Cobalt	2,414	2,823	2,804	3,098	3,417 2/
Copper:					
Mine output:					
Concentrate	36,002	31,116	28,561	29,000	28,000
Cu content	8,696	7,412	6,799	7,400 r/	6,671 2/
Metal, primary and secondary:					
Smelter	37,205	39,516	31,146	35,300	32,639 2/
Refined	37,200	39,400	34,322	28,526	26,000
Gold e/ kilograms	800	200	--	--	--
Iron and steel:					
Iron ore and concentrate:					
Gross weight thousand tons	2,162	2,364	2,012	1,705 2/	1,700
Fe content do.	1,532	1,650	1,348	1,118 2/	1,100
Metal:					
Pig iron e/ do.	73 2/	70	70	70	70
Ferroalloys:					
Ferrochromium do.	80	120	148 r/	110	145
Ferromanganese do.	226	249	213	215	215
Ferrosilicomanganese do.	219	197	210 r/	210 r/ e/	210
Ferrosilicon (75% basis) do.	400	456	474	462	470
Silicon metal do.	81	92	101	110	110
Other e/ do.	14	14	15	15	15
Total do.	1,020	1,128	1,161	1,122 r/	1,165
Steel, crude do.	505	456	503	511	510
Semimanufactures, rolled e/ do.	290	300	300	300	300
Lead, mine output:					
Concentrate	3,224	5,953	2,505	2,600	3,600
Pb content	1,698	3,096	1,462 r/	2,080 r/	3,000
Magnesium, primary	27,300	27,635	28,000 e/	28,000	28,000
Nickel:					
Mine output:					
Concentrate	31,719	26,470	24,927	23,000 r/ e/	20,000
Ni content	3,462	3,328 r/	3,386 r/	3,135 r/	2,454 2/
Metal, primary	56,817	67,955	53,237	61,582	62,702 2/
Platinum-group metals e/ 3/ kilograms	1,500	1,500	1,500	1,200	1,000
Titanium:					
Ilmenite concentrate thousand tons	713	826	833	750 e/	750
TiO2 content do.	315	320	325 e/	390	390
Zinc:					
Mine output:					
Concentrate	27,469	30,117	18,995	19,000	9,000
Zn content	14,327	15,869	9,877	9,880	4,500
Metal, primary	129,192	131,921	121,576	134,900 r/	137,400
INDUSTRIAL MINERALS					
Cement, hydraulic thousand tons	1,664	1,444	1,613	1,664 r/	1,700
Feldspar	75,000 e/	62,905	75,397	76,000	75,000
Graphite e/	6,500	5,566	2,588	2,600	2,600
Lime, hydrated, and quicklime e/ thousand tons	100	100	100	100	100
Mica, flake e/	3,000	3,000	3,000	2,500	2,500
Nepheline syenite thousand tons	350 e/	279	294	300	300
Nitrogen, N content of ammonia do.	315	271	289 r/	295 r/	279 2/
Olivine sand do.	2,955	3,109	3,517	3,600	3,600
Pyrite do.	92	1	5	6	5
Stone, crushed:					
Dolomite do.	650	743	797	800	800
Limestone do.	3,500 e/	4,357	4,675	4,600	4,500
Quartz and quartzite do.	900	891	963	960	1,000

See footnotes at end of table.

TABLE 1--Continued
NORWAY: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
INDUSTRIAL MINERALS--Continued						
Sulfur: e/						
Pyrite, S content	thousand tons	44	1	--	--	--
Byproduct of:						
Metallurgy	do.	75	75	80	80	60
Petroleum	do.	15	15	20	20	50
Total sulfur	do.	134	91	100	100	110
Talc, soapstone, steatite e/	do.	50	28	30	28 r/	28
MINERAL FUELS AND RELATED MATERIALS						
Coal, all grades	thousand tons	266	301	343	261	260
Gas, natural:						
Gross	million cubic meters	28,867	30,833	47,200	59,400	70,300
Marketed 4/	do.	28,500	26,800	27,800	37,400	42,600
Peat: e/						
For agricultural use	do.	30	30	30	30	30
For fuel use	do.	1	1 r/	1 r/	1 r/	1
Petroleum:						
Crude 5/	thousand 42-gallon barrels	855,643	956,369	979,104	1,104,096	1,105,584 2/
Natural gas liquids e/	do.	25,342 2/	24,500	40,560	41,600	42,000
Refinery products:						
Naphtha e/	do.	4,000	20,000	22,100	26,350	26,000
Gasoline	do.	28,680	27,149	24,470	25,000	25,000
Kerosene	do.	8,499	9,068	8,378	9,000	9,000
Distillate fuel oil	do.	48,515	50,832	45,140	45,000	45,000
Residual fuel oil	do.	10,700	11,255	12,361	12,000	12,000
Other e/	do.	4,000	4,000	4,000	4,000	4,000
Refinery fuel and losses e/	do.	4,000	4,000	4,000	4,000	4,000
Total e/	do.	108,394	126,304	120,449	125,350	125,000

e/ Estimated. r/ Revised.

1/ Table includes data available through July 1998.

2/ Reported figure.

3/ Data represent exports.

4/ Reported as total methane sales.

5/ Excluding natural gas liquids.

TABLE 2
NORWAY: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	Hydro Aluminium ANS (Norsk Hydro A/S 70%)	Smelters at Årdal, Hoyanger, Karmoy, and Sunndalsora	600
Do.	Elkem Aluminium (Elkem A/S 50% and Alcoa 50%)	Smelters at Farsund and Mosjoen	250
Do.	Sor-Norge Aluminium A/S (Alusuisse 50% and Hydro Aluminium 49%)	Smelter at Odda	50
Cadmium	Norzink AS (Boliden AB 50% and Rio Tinto Minerals Development Ltd.)	Smelter at Eitrheimsneset	0.3
Cement	Norcem A/S	Plants at Brevik and Kjopsvik	2,150
Coal	Store Norske Spitsbergen Kulkompani A/S	Mines at Longyearbyen and Svea	450
Cobalt	Nikkelverk A/S (Falconbridge Nickel Mines Ltd., 100%)	Smelter at Kristiansand	3
Copper:			
Ore, Cu content	Grong Guber A/S (Norsulfid A/S, 100%)	Mines at Royrvik and Gjersvik	8
Do.	Nikkel og Olivin AS (Norsulfid A/S, 100%)	Mine at Narvik	1
Metal	Nikkelverk A/S (Falconbridge Nickel Ltd., 100%)	Smelter at Kristiansand	40
Dolomite	Franzefoss Bruk A/S	Mine at Ballagen	350
Do.	Norwegian Holding A/S	Mines at Hammerfall, Logavlen, and Kvitblikk	500
Feldspar	Franzefoss Bruk A/S	Mine at Lillesand	100
Ferroalloys	Elkem Rana (Elkem A/S, 100%)	Ferrochromium plant at Mo i Rana	140
Do .	Elkem Sauda (Elkem A/S, 51%, and BHP, 49%)	Ferromanganese plant at Sauda	250
Do.	Elkem PEA (Elkem A/S, 51%, and BHP, 49%)	Ferromanganese plant at Porsgrunn	200
Do.	Elkem Salten (Elkem A/S, 100%)	Ferrosilicon plant at Straumen	85
Do.	Elkem Bjolvefossen (Elkem A/S, 100%)	Ferrosilicon plant at Alvik	60
Do.	Elkem Thamshavn (Elkem A/S, 100%)	Ferrosilicon plant at Orkanger	60
Do .	Finnfjord Smelterverk, Rana Metal (Fesil 100%)	Ferrosilicon plant at Mo i Rana	140
Do.	A/S Hafslung Metal (Fesil 100%)	Ferrosilicon plant at Sarpsborg	75
Do.	Ila og Lilleby Smelterverk (Fesil 100%)	Ferrosilicon plant at Finnsnes	60
Do.	Oye Smelterverk (Tinfos Jernverk A/S, 100%)	Silicomanganese plant at Kvinesdal	235
Iron, metal	Ulstein Jernstoperi A/S	Hordvikneset	10
Iron ore	Rana Gruber A/S (Norsk Jernverk Holding A/S, 100%)	Mine at Mo i Rana	2,000
Do.	A/S Sydvaranger (Government, 87.45%)	Bjornevatn Mine at Kirkenes	1,500
Lead ore, Pb content	A/S Bleikvassli Gruber (A/S Sydvaranger, 100%)	Mine at Bleikvassli	2
Lime	Hylla Kalkverk (Nikolai Bruch A/S 100%)	Verdal/Trondheim Mine and plant	80
Do.	A/S Norsk Jernverk	Plant at Mo i Rana	48
Do.	Ardal og Sunndal Verk A/S	More og Romsdal Mine at Sunadal	20
Do.	Breivik Kalkverk A/S	Alesund Mine at Larsnes	20
Do.	Mjoendalen Kalkfabrik	Plant at Asen/Drammen	7
Limestone	Norcem A/S	Dalen, Bjorntvedt, and Kjopsvik Mines	1,600
Do.	Vardelskalk A/S (Franzefoss Burk A/S, 100%)	Sandvika Mine	800
Do.	Breivik Klakverk A/S	Visnes and Glaerum Mines	500
Magnesium	Norsk Hydro A/S (Government, 51%)	Plant at Porsgrunn	35
Natural gas million cubic meters	Den Norske Stats Oljeselskap A/S	Gama, Gullfaks, Sleipner Ost, and Statfjord Fields	12,270
Do.	Phillips Petroleum Company Norway	Ekofisk Field	9,900
Do.	Elf Petroleum Norge A/S	Frigg, Heimdal, and Ost-Frigg Fields	5,750
Do.	Norsk Hydro Produksjon A/S	Troll-Oseberg Field	2,600
Do.	BP Petroleum Development of Norway	Gyda and Ula Fields	1,040
Do.	Esso Norge as	Odin Field	1,000
Do.	Amoco Norway A/S	Hod and Valhall Fields	910
Nepheline syenite	North Cape Mineral A/S (Unimin Corp., 84%)	Mine at Stjernoy	350
Nickel:			
Ore, Ni content	Nikkel og Olivin A/S (Norsulfid A/S, 100%)	Mine at Narvik	3
Do.	Titania A/S (Kronos Norge A/S, 100%)	Mine at Tellnes	0.5
Metal	Nikkelverk A/S (Falconbridge Nickel Mines Ltd., 100%)	Smelter at Kristiansand	60
Olivine	A/S Olivin	Åheim Mine at Sunnmore	2,500
Do.	Franzefoss Bruk A/S	Lefdal Mine at Bryggja	500
Do.	Idustrimineraler A/S	Stranda Mine at Nordfjord	300

TABLE 2--Continued
NORWAY: STRUCTURE OF THE MINERAL INDUSTRY FOR 1997

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum	barrels per day	Den Norske Stats Oljeselskap A/S	Gullfaks, Statfjord, Tommeliten, and Veslefrikk Fields	1,069.300
Do.		Norsk Hydro Produksjon A/S	Brage, Mime, and Oseberg Fields	566.200
Do.		Phillips Petroleum Company Norway	Ekofisk Field	237,500
Do.		Saga Petroleum A/S	Snorre Field	170,000
Do.		BP Petroleum Development of Norway	Gyda and Ula Fields	155.000
Do.		A/S Norske Shell	Draugen Field	90,000
Pyrite		Folldal Verk A/S (Norsulfid A/S 100%)	Mine at Hjerkinn	10
Quartzite		Elkem Tana (Elkem A/S 100%)	Mine at Tana	540
Do.		Elkem Marnes (Elkem A/S 100%)	Mine at Sandhornoy	200
Do.		Vatnet Kvarts A/S	Mine at Nordland	150
Do.		Snekkevik Kvartsbrudd	Mine at Kragero	110
Steel		Fundia AB (Norsk Jenverk 50% and Rataruukki 50%)	Plants at Christiania, Spigerverk, Mandal Stal, and Moi Rana	600
Talc		A/S Norwegian Talc (Pluess-Staufer AG 51%)	Mine/plant at Altermark/Knarrevik and Framfjord	90
Do.		Kvam Minerals A/S	Mine/plant at Kvam	6
Titanium, concentrate		Titania A/S (Kronos Norge A/S 100%)	Mine at Tellnes	800
Zinc:				
Ore, Zn content		Grong Guber A/S (Norsulfid A/S 100%)	Mines at Royrvik and Gjersvik	10
Do.		A/S Bleikvassli Gruber (A/S Sydvaranger 100%)	Mine at Bleikvassli	10
Metal		Norzik A/S (Boliden Mineral AB 50%)	Smelter at Eitrheimsneset	137

TABLE 3
NORWAY: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
METALS				
Akali and akaline-earth metals:				
Alkali metals	value, thousands	$1	--	All to Finland.
Alkaline-earth metals		11	9	France 1; Switzerland 1.
Aluminum:				
Ore and concentrate		2,500	--	All to Sweden.
Oxides and hydroxides		93	--	France 58; Sweden 28; Czech Republic 7.
Metal including alloys:				
Scrap		19,443	--	Germany 7,218; Netherlands 4,069; United Kingdom 2,236.
Unwrought		875,679	227	Germany 267,136; France 120,633; United Kingdom 102.588.
Semimanufactures		196,459	3,945	Germany 43,338; United Kingdom 31,584; France 25,397.
Beryllium, metal including alloys, all forms	value, thousands	$21	--	Switzerland $10; Maldives $6; Sweden $2.
Cadmium, metal including alloys, all forms		172	--	Belgium-Luxembourg 120; Sweden 40; Germany 10.
Chromium:				
Oxides and hydroxides		12	--	Turkey 9; Singapore 2; Saudi Arabia 1.
Metal including alloys, all forms		1	--	All to Sweden.
Cobalt, metal including alloys, all forms		3,149	1,521	Netherlands 367; Belgium-Luxembourg 225; United Kingdom 151.
Copper:				
Ore and concentrate		35,024	--	All to Finland.
Metal including alloys:				
Scrap		10,998	394	Sweden 2,689; Germany 2,289; Hong Kong 2,036.
Unwrought		35,185	(2/)	United Kingdom 22,709; Sweden 9,293; France 1,590.
Semimanufactures		5,002	(2/)	Denmark 2,120; Sweden 1,071; Germany 735.
Gold:				
Waste and sweepings	value, thousands	$16,794	--	Germany $16,127; Switzerland $484; Sweden $79.
Metal including alloys, unwrought and partly wrought	kilograms	1,560	--	United Kingdom 573; Sweden 506; Finland 322.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite		610,786	--	Germany 382,592; United Kingdom 102,165; Sweden 82,299.
Pyrite, roasted		155,982	--	Germany 98,506; Denmark 52,618; Sweden 4,857.
Metal:				
Scrap		145,081	--	United Kingdom 53,137; Germany 37,687; Netherlands 23,977.
Pig iron, cast iron, related materials		700	--	Germany 486; Sweden 109; Chile 53.
Ferroalloys:				
Ferrosilicomanganese		187,244	22,457	Germany 33,321; Italy 24,369; Belgium-Luxembourg 19,768.
Ferrosilicon		414,036	69,036	Germany 89,052; Italy 41,287; United Kingdom 63,496.
Silicon metal 3/		97,136	1,462	Germany 48,447; United Kingdom 14,619; Japan 13,744.
Unspecified		50,097	2,121	France 25,855; Italy 5,576; United Kingdom 2,913.
Steel, primary forms		155,172	--	Finland 65,151; Switzerland 42,438; Hong Kong 20,062.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated		44,529	--	Sweden 27,005; Denmark 6,039; Spain 2,843.

See footnotes at end of table.

TABLE 3--Continued
NORWAY: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
METALS--Continued				
Iron and steel--Continued:				
Metal--Continued:				
Semimanufactures--Continued:				
Flat-rolled products--Continued:				
Clad, plated, coated		125,129	24,479	Sweden 35,261; United Kingdom 29,228; Netherlands 17,638.
Of alloy steel		2,527	(2/)	Germany 832; Sweden 395; United Kingdom 281.
Bars, rods, angles, shapes, sections		311,937	7,710	Sweden 51,338; United Kingdom 51,006; Finland 36,844.
Rails and accessories		3,865	--	Sweden 2,848; Republic of Korea 546; Italy 284.
Wire		12,477	5	Sweden 3,504; United Kingdom 3,355; Denmark 1,348.
Tubes, pipes, fittings		96,582	190	Denmark 69,014; United Kingdom 8,843; Sweden 5,277.
Lead:				
Ore and concentrate		2,140	--	All to Germany.
Oxides		1	--	All to Sweden.
Metal including alloys:				
Scrap		9,625	--	United Kingdom 6,325; Sweden 2,587; Germany 443.
Semimanufactures		174	--	Denmark 173; Sweden 1.
Magnesium, metal including alloys:				
Scrap		86	86	
Semimanufactures		695	--	Sweden 542; United Kingdom 145; Denmark 3.
Manganese:				
Oxides and hydroxides		31,001	340	United Kingdom 22,560; Sweden 5,051; Denmark 668.
Metal including alloys, all forms		1,540	307	Germany 555; Spain 445; United Kingdom 177.
Mercury	value, thousands	$2	--	All to Switzerland.
Molybdenum, metal including alloys, semimanufactures	do.	$1	--	All to Germany.
Nickel:				
Ore and concentrate		34,880	--	All to Finland.
Matte and speiss		2	--	Germany 1.
Metal including alloys:				
Scrap		294	52	Germany 242.
Unwrought		61,030	21,828	Netherlands 15,550; Japan 7,144; Sweden 3,727.
Semimanufactures		30	--	Sweden 20; United Kingdom 10.
Platinum-group metals:				
Waste and sweepings	value, thousands	$1	--	All to Republic of Korea.
Metal including alloys, unwrought and partly wrought	do.	$33,399	$11,747	United Kingdom $15,088; Japan $5,050; Switzerland $996.
Silver, metal including alloys, unwrought and partly wrought	do.	$17,646	--	Sweden $7,012; Finland $6,917; Denmark $2,651.
Tin:				
Ore and concentrate		189,970	90,131	Netherlands 99,839.
Metal including alloys:				
Scrap		25	9	Sweden 16.
Unwrought		3	--	Mainly to United Kingdom.
Semimanufactures		4	--	United Kingdom 3; Germany 1.
Titanium:				
Oxides		103	(2/)	Sweden 40; Slovakia 24; Portugal 16.
Metal including alloys:				
Unwrought including waste and scrap		7	3	Netherlands 4.
Semimanufactures		92	13	United Kingdom 56; Italy 7; Germany 5.
Tungsten, metal including alloys, semimanufactures	value, thousands	$4	--	Germany $2; Denmark $1; Sweden $1.
Zinc:				
Ore and concentrate		2,200	--	All to Poland.
Oxides		3,656	--	United Kingdom 1,732; Germany 860; Australia 397.

See footnotes at end of table.

TABLE 3--Continued
NORWAY: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
METALS--Continued				
Zinc--Continued:				
Metal including alloys:				
Scrap		410	--	Unspecified Asia 214; United Kingdom 110; Netherlands 44.
Unwrought		121,410	2,002	United Kingdom 41,100; Germany 38,795; Sweden 17,161.
Semimanufactures 4/		817	--	Germany 701; Sweden 38; Romania 33.
Zirconium:				
Ore and concentrate		4,230	2,226	United Kingdom 1,850; Netherlands 150; Italy 3.
Metal including alloys: Semimanufactures		10	--	Mainly to Romania.
Other:				
Ores and concentrates		10	--	All to United Kingdom.
Oxides and hydroxides		918	--	Netherlands 616; Hungary 301; Finland 1.
Ashes and residues		6,687	--	France 2,592; Belgium-Luxembourg 1,744; Spain 1,501.
Base metals including alloys, all forms		31	--	Germany 30; France 1.
Metalloids 5/	value, thousands	$7	--	Sweden $4; France $3.
Precious metals, n.e.s.:				
Ores and concentrates	do.	$155	--	All to Sweden.
Waste and sweepings	do.	$4,654	--	Germany $2,866; Sweden $1,296; Denmark $428.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural, corundum, emery, pumice, etc.		7	--	Mainly to Sweden.
Artificial corundum		1	--	Mainly to Germany.
Grinding and polishing wheels and stones		520	33	Finland 158; Sweden 117; Germany 42.
Barite and witherite		6,945	--	United Kingdom 4,600; Denmark 2,300; Qatar 42.
Boron, oxides and acids	value, thousands	$2	--	All to Iceland.
Bromine, fluorine, iodine	value, thousands	$31	--	Denmark $25; Iceland $6.
Clays, crude:				
Bentonite		27	--	Denmark 17; Egypt 6; Saudi Arabia 2.
Kaolin		46	--	Sweden 32; Singapore 5; Thailand 4.
Unspecified		514	--	Sweden 456; Germany 44; Italy 11.
Cryolite and chiolite		324	--	Netherlands 150; Denmark 101; United Kingdom 72.
Diamond, natural, gem, not set or strung	value, thousands	$235	--	Denmark $105; Belgium-Luxembourg $88; Germany $24.
Diatomite and other infusorial earth		272	--	Italy 215; Sweden 29; Denmark 15.
Feldspar		377,973	--	Germany 80,165; Netherlands 70,519; United Kingdom 65,214.
Fertilizer materials:				
Crude, n.e.s.		366	51	Spain 42; Italy 41; Thailand 26.
Manufactured:				
Ammonia		18	--	Unspecified Europe 17; Russia 1.
Nitrogenous		120	--	United Kingdom 108; Finland 12.
Unspecified and mixed		2,802	--	Spain 2,763; Iceland 21; Sweden 15.
Gypsum and plaster		48	--	Lithuania 32; Poland 12; Finland 2.
Lime		28,967	--	Finland 22,108; Sweden 5,635; Italy 26.
Mica:				
Crude including splittings and waste		1,795	--	Netherlands 757; Germany 448; United Kingdom 132.
Worked including agglomerated splittings		1	--	All to Argentina.
Phosphates, crude		22	--	Mainly to Sweden.
Pigments, mineral, iron oxides and hydroxides, processed		711,060	248	Germany 651,034; Sweden 36,220; Canada 20,704
Precious and semiprecious stones other than diamond, natural	value, thousands	$76	--	Denmark $32; Germany $14; Belgium-Luxembourg $11.
Salt and brine		5,192	--	Sweden 1,503; Spain 1,279; Faeroe Islands 948.

See footnotes at end of table.

TABLE 3--Continued
NORWAY: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
INDUSTRIAL MINERALS--Continued				
Sodium compounds, n.e.s.:				
Soda ash, manufactured		22	--	Mainly to Belgium-Luxembourg.
Sulfate, manufactured		36	--	All to United Kingdom.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked		892,088	702	Germany 330,307; United Kingdom 250,676; Denmark 110,229.
Worked		26,415	(2/)	Netherlands 16,441; Sweden 5,633; Germany 1,684.
Dolomite, chiefly refractory-grade	value, thousands	$1	--	Unspecified Europe.
Gravel and crushed rock	thousand tons	8,985	148	Germany 4,007; Denmark 1,733; United Kingdom 950.
Limestone other than dimension		63,706	--	Sweden 23,793; Finland 10,307; Benin 10,000.
Quartz and quartzite		78,390	--	Iceland 73,956; Netherlands 2,810; Poland 745
Sand other than metal-bearing		3,570	--	Sweden 2,521; Denmark 906; Germany 99.
Sulfur:				
Elemental:				
Crude including native and byproduct		49	--	Sweden 29; United Kingdom 20.
Colloidal, precipitated, sublimed		10,264	--	United Kingdom 8,216; Denmark 1,120; Sweden 696.
Dioxide		16	--	All to Sri Lanka.
Talc, steatite, soapstone, pyrophyllite		35,800	8	Netherlands 11,975; United Kingdom 8,678; Germany 5,757.
Vermiculite, perlite, chlorite		146	--	Sweden 124; Netherlands 22.
Other:				
Crude		72	--	Finland 34; Sweden 28; Singapore 8.
Slag and dross, not metal-bearing		86,399	1,991	Japan 28,631; Denmark 13,570; Sweden 10,800
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural		119	--	Iceland 44; Denmark 28; Sweden 25.
Carbon black		122	--	Singapore 61; Turkey 15; United Arab Emirates 10
Coal, briquets of anthracite and bituminous coal		8	--	All to Denmark.
Gas, natural, gaseous	thousand tons	30,507	--	Germany 12,017; France 8,794; Belgium-Luxembourg 3,675.
Peat including briquets and litter		8,488	(2/)	Germany 5,137; Netherlands 2,151; Sweden 596
Petroleum:				
Crude	thousand tons	136,824	12,613	United Kingdom 42,875; Netherlands 23,991; France 12,964.
Refinery products:				
Liquefied petroleum gas	do.	3,156	298	United Kingdom 549; Belgium-Luxembourg 516, Germany 241.
Gasoline	do.	4,785	305	Denmark 1,004; Netherlands 624; Germany 302
Mineral jelly and wax		6,804	350	Sweden 5,406; Canada 174; Finland 172.
Kerosene and jet fuel		457,488	--	United Kingdom 144,153; Denmark 114,035; Iceland 92,816.
Distillate fuel oil	thousand tons	3,097	135	Germany 732,827; United Kingdom 543,250; Netherlands 397,411.
Lubricants		11,802	7	Denmark 8,331; Sweden 1,825; Ireland 489.
Residual fuel oil	thousand tons	1,907	200	Italy 1,046; United Kingdom 266; Netherlands 162
Bitumen and other residues		286	--	All to Sweden.
Bituminous mixtures		35	--	Sweden 17; Iceland 15; United Kingdom 3.
Petroleum coke		128,729	--	Netherlands 88,479; France 17,524; Germany 10,665.

1/ Table prepared by Glenn J. Wallace.
2/ Less than 1/2 unit.
3/ May include high-purity silicon.
4/ Includes zinc dust, flakes, and powders.
5/ Reported under SITC item number as "selenium, tellurium, phosphorus, arsenic, etc."

Source: United Nations Statistical Office (microfiche).

TABLE 4
NORWAY: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity	Total	Sources	
		United States	Other (principal)
METALS			
Akali and akaline-earth metals:			
Alkali metals	25	(2/)	United Kingdom 20; Germany 5.
Alkaline-earth metals	764	--	Russia 337; China 193; Hong Kong 57.
Aluminum:			
Ore and concentrate	22,549	--	Greece 20,781; Guyana 1,615; Germany 107.
Oxides and hydroxides thousand tons	1,699	(2/)	Suriname 534; Ireland 260; Australia 130.
Metal including alloys:			
Scrap	63,038	--	Russia 24,694; Germany 23,339; United Kingdom 5,273.
Unwrought	149,540	19	Russia 118,325; Brazil 8,353; Netherlands 4,771.
Semimanufactures	39,420	767	Sweden 10,274; Germany 3,407; Hungary 2,588.
Antimony, metal including alloys, all forms value, thousands	$7	--	Germany $6; Denmark $1.
Beryllium, metal including alloys, all forms do.	$9	--	Sweden $4; United Kingdom $2; Denmark $1.
Bismuth, metal including alloys, all forms do.	$6	--	Japan $3; Denmark $2; Sweden $1.
Cadmium, metal including alloys, all forms do.	$37	$15	Japan $20; Sweden $1; Unioted Kingdom $1.
Chromium:			
Oxides and hydroxides	89	(2/)	Germany 39; United Kingdom 31; China 16.
Metal including alloys, all forms	54	--	Netherlands 18; Switzerland 16; Germany 13.
Cobalt:			
Oxides and hydroxides	696	--	Sweden 387; Ireland 307; Germany 1.
Metal including alloys, all forms	1,754	(2/)	Australia 656; Congo (Kinshasa) 619; Belgium-Luxembourg 281.
Columbium and tantalum, tantalum metal including alloys, all forms value, thousands	$21	--	United Kingdom $17; Germany $2; Italy $2.
Copper:			
Matte and speiss including cement copper	1	--	All from Sweden.
Metal including alloys:			
Scrap	5,777	175	Denmark 1,945; Sweden 1,812; Latvia 1,105.
Unwrought	3,156	(2/)	United Kingdom 1,823; Sweden 838; Germany 404.
Semimanufactures	25,475	193	Sweden 9,149; Germany 5,840; France 3,052.
Germanium, metal including alloys, all forms	1	--	All from Germany.
Gold:			
Waste and sweepings value, thousands	$3,334	--	Finland $2,398; Sweden $409; Germany $262.
Metal including alloys, unwrought and partly wrought kilograms	4,031	43	Germany 2,929; Ireland 329; Switzerland 261.
Iron and steel:			
Iron ore and concentrate, excluding roasted pyrite	470,188	--	South Africa 443,353; Canada 14,815; Belarus 11,971.
Metal:			
Scrap	215,746	--	Germany 175,962; Russia 33,016; Latvia 2,932.
Pig iron, cast iron, related materials	13,529	(2/)	Canada 6,873; Russia 1,809; United Kingdom 1,619.
Ferroalloys:			
Ferrochromium	660	16	Sweden 547; Netherlands 47; Germany 31.
Ferromanganese	6,078	--	South Africa 4,953; France 1,000; Sweden 124.
Ferrosilicomanganese	49	(2/)	Mainly from Poland.
Ferrosilicon	6,581	(2/)	Russia 2,421; Iceland 1,821; Kazakstan 1,000.
Silicon metal 3/	5,380	(2/)	Brazil 3,590; South Africa 1,286; China 270.
Unspecified	728	21	Sweden 249; United Kingdom 237; China 53.
Steel, primary forms	124,347	3	Germany 58,607; Czech Republic 46,727; United Kingdom 11,393.
Semimanufactures:			
Flat-rolled products:			
Of iron or nonalloy steel:			
Not clad, plated, coated	536,169	16,415	Netherlands 126,837; Sweden 80,605; Germany 63,740.
Clad, plated, coated	120,988	43	Sweden 49,960; United Kingdom 24,643; Belgium-Luxembourg 15,250.
Of alloy steel	51,604	3	Germany 14,606; Sweden 13,585; Finland 8,263.
Bars, rods, angles, shapes, sections	278,438	169	Sweden 56,695; United Kingdom 43,838; Germany 39,136.
Rails and accessories	22,335	--	United Kingdom 10,320; Austria 6,052; Sweden 2,327.
Wire	19,860	40	Belgium-Luxembourg 8,607; Sweden 5,420; France 1,514.
Tubes, pipes, fittings	388,843	3,143	Japan 187,285; Germany 71,019; United Kingdom 26,462.

See footnotes at end of table.

TABLE 4--Continued
NORWAY: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity	Total	Sources	
		United States	Other (principal)
METALS--Continued			
Lead:			
Oxides	699	(2/)	Sweden 565; Germany 96; Finland 30.
Metal including alloys:			
Scrap	92	--	Sweden 67; Denmark 25.
Unwrought	4,305	--	Sweden 1,832; United Kingdom 1,626; Germany 472.
Semimanufactures	1,222	(2/)	Germany 517; Netherlands 478; Sweden 114.
Magnesium, metal including alloys:			
Scrap	3,827	125	Canada 2,486; Finland 533; Italy 251.
Unwrought	7,152	243	Russia 3,052; Canada 2,388; China 769.
Semimanufactures	48	6	Israel 25; United Kingdom 8; Germany 4.
Manganese:			
Ore and concentrate, metallurgical-grade	676,573	--	Australia 320,260; South Africa 242,676; Gabon 64,958.
Oxides and hydroxides	513	7	Netherlands 411; Belgium-Luxembourg 69; France 22.
Metal including alloys, all forms	1,540	307	Germany 555; Spain 445; United Kingdom 177.
Mercury value, thousands	$23	$17	Netherlands $3; Germany $2; Switzerland $1.
Molybdenum, metal including alloys:			
Unwrought including waste and scrap	14	--	Mainly from United Kingdom.
Semimanufactures	2	(2/)	Austria 1; Germany 1.
Nickel:			
Matte and speiss	141,941	--	Canada 93,499; South Africa 43,503; Australia 3,891.
Metal including alloys:			
Scrap	24	--	United Kingdom 23; Latvia 1.
Unwrought	204	8	Sweden 99; Belgium-Luxembourg 56; United Kingdom 34.
Semimanufactures	438	5	United Kingdom 235; Germany 63; Japan 54.
Platinum-group metals:			
Waste and sweepings value, thousands	$10,809	--	Netherlands $3,154; Germany $2,756; France $2,137.
Metal including alloys, unwrought and partly wrought do.	$4,885	$147	United Kingdom $1,607; Switzerland $1,444; Germany $994.
Silver, metal including alloys, unwrought and partly wrought do.	$20,814	$622	Sweden $10,351; Germany $5,976; United Kingdom $1,248.
Tin, metal including alloys:			
Scrap	1	--	Mainly from United Kingdom.
Unwrought	623	--	China 428; Netherlands 85; United Kingdom 54.
Semimanufactures	117	(2/)	Sweden 54; China 22; United Kingdom 20.
Titanium:			
Ore and concentrate	29,637	--	India 29,278; Australia 153; Netherlands 54.
Oxides	1,513	31	Germany 680; Belgium-Luxembourg 669; Saudi Arabia 36.
Metal including alloys:			
Unwrought including waste and scrap	60	3	United Kingdom 37; Spain 11; Germany 6.
Semimanufactures	478	7	Italy 208; Sweden 73; China 67.
Tungsten, metal including alloys:			
Unwrought including waste and scrap	1	--	Mainly from Israel.
Semimanufactures	4	(2/)	Germany 2; Israel 1.
Uranium and thorium, uranium metal including alloys, all forms value, thousands	$489	$78	Germany $295; Belgium-Luxembourg $67; Finland $20.
Vanadium, metal including alloys, all forms do.	$4	$4	
Zinc:			
Ore and concentrate	189,328	--	Sweden 79,273; Canada 56,392; Ireland 19,150.
Oxides	2,414	--	Germany 1,519; Switzerland 346; India 208.
Metal including alloys:			
Scrap	2,423	--	Denmark 1,319; Sweden 344; Finland 236.
Unwrought	1,348	--	Russia 1,080; Sweden 143; United Kingdom 56.
Semimanufactures 4/	1,374	(2/)	Germany 900; France 222; Sweden 77.
Zirconium:			
Ore and concentrate	440	--	South Africa 222; Sweden 128; Netherlands 60.
Metal including alloys:			
Unwrought including waste and scrap	18	--	Mainly from Australia.
Semimanufactures	19	(2/)	Germany 12; United Kingdom 5; France 1.

See footnotes at end of table.

TABLE 4--Continued
NORWAY: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity	Total	Sources	
		United States	Other (principal)
METALS--Continued			
Other:			
Oxides and hydroxides	1,260	59	France 875; United Kingdom 199; Germany 64.
Ashes and residues	219,228	20	Germany 68,954; Sweden 46,330; Denmark 43,255.
Base metals including alloys, all forms value, thousands	$182	--	United Kingdom $138; Russia $35; Germany $9.
Metalloids 5/	91	--	Denmark 39; Bolivia 18; Germany 18.
Precious metals, n.e.s., waste and sweepings value, thousands	$6,835	--	Finland $2,620; Sweden $2,545; Denmark $1,243.
INDUSTRIAL MINERALS			
Abrasives, n.e.s.:			
Natural: Corundum, emery, pumice, etc.	15,447	48	Iceland 15,115; Germany 86; Denmark 45.
Artificial corundum	1,118	2	United Kingdom 436; France 435; Germany 153.
Dust and powder of precious and semiprecious stones including diamonds value, thousands	$334	$19	Romania $108; Netherlands $72; Germany $43.
Grinding and polishing wheels and stones	1,125	6	Netherlands 306; Austria 249; Germany 156.
Barite and witherite	142,170	13	Morocco 139,172; United Kingdom 2,544; Netherlands 270.
Boron, crude natural borates	39	39	
Bromine, fluorine, iodine	447	1	Japan 257; Chile 115; Belgium-Luxembourg 41.
Cement	155,105	103	United Kingdom 123,627; Spain 19,759; Sweden 4,402.
Chalk	7,026	1	Denmark 4,308; Sweden 1,622; United Kingdom 532.
Clays, crude:			
Bentonite	24,533	8,012	Greece 11,175; United Kingdom 1,894; Italy 1,261.
Kaolin	224,811	612	United Kingdom 211,504; Czech Republic 5,071; Sweden 4,652.
Unspecified	9,675	818	France 3,491; Czech Republic 1,990; Poland 770.
Cryolite and chiolite	409	--	All from United Kingdom.
Diamond, natural:			
Gem, not set or strung value, thousands	$4,000	$15	Belgium-Luxembourg $2,358; Israel $624; Germany $301.
Industrial stones do.	$76	--	Belgium-Luxembourg $29; Romania $11; Israel $10.
Diatomite and other infusorial earth	1,472	506	Germany 212; Denmark 204; Spain 176.
Feldspar	889	--	Sweden 887; France 2.
Fertilizer materials:			
Crude, n.e.s.	1,923	17	Denmark 1,234; Sweden 528; Germany 82.
Manufactured:			
Ammonia	338,704	1	Latvia 150,582; Russia 90,200; Ukraine 78,588.
Nitrogenous	118,370	3	Sweden 40,813; Belgium-Luxembourg 24,948; Germany 20,900.
Phosphatic	1,585	--	Denmark 1,087; Netherlands 440; Sweden 58.
Potassic	542,620	10	Russia 302,998; Germany 72,947; France 58,502.
Unspecified and mixed	55,850	--	Belgium-Luxembourg 39,729; Sweden 8,642; Netherlands 2,972.
Graphite, natural	212	7	Poland 94; Sweden 81; United Kingdom 25.
Gypsum and plaster	305,342	59	Spain 185,953; Germany 74,567; Denmark 44,121.
Lime	33,345	8	Sweden 26,466; Germany 2,905; Denmark 2,785.
Magnesium compounds:			
Magnesite, crude	243	1	Austria 116; Germany 79; China 20.
Oxides and hydroxides	4,833	78	Netherlands 2,336; Switzerland 2,255; France 42.
Mica:			
Crude including splittings and waste	2,553	--	India 2,112; China 265; Netherlands 130.
Worked including agglomerated splittings	62	(2/)	Switzerland 28; Sweden 17; Belgium-Luxembourg 6.
Nitrates, crude	166	--	Germany 119; Sweden 23; Switzerland 14.
Phosphates, crude	680,851	3	Russia 647,104; South Africa 23,425; Latvia 5,751.
Pigments, mineral, iron oxides and hydroxides, processed	1,889	20	Germany 1,163; China 507; Spain 71.
Precious and semiprecious stones other than diamond:			
Natural value, thousands	$587	$50	Germany $123; Denmark $113; Brazil $98.
Synthetic do.	$74	$4	Romania $23; Hong Kong $18; Germany $14.
Pyrite, unroasted	244,894	--	All from Finland.
Quartz crystal, piezoelectric value, thousands	$4	--	Germany $1; Italy $1; Japan $1.
Salt and brine	675,716	23	Netherlands 273,504; Spain 163,929; Denmark 76,717.
Sodium compounds, n.e.s.:			
Soda ash, manufactured	61,316	33	Poland 32,030; Netherlands 17,802; Germany 7,712.
Sulfate, manufactured	2,854	--	Sweden 1,258; Spain 983; Finland 447.

See footnotes at end of table.

TABLE 4--Continued
NORWAY: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity	Total	Sources	
		United States	Other (principal)
INDUSTRIAL MINERALS--Continued			
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	16,311	(2/)	Sweden 7,722; Portugal 6,519; Italy 904.
Worked	40,267	--	Portugal 21,197; India 7,374; Germany 3,732.
Dolomite, chiefly refractory-grade	9,319	--	Sweden 7,970; Germany 1,076; United Kingdom 243.
Gravel and crushed rock	89,318	--	Sweden 80,236; Finland 4,561; United Kingdom 3,292.
Limestone other than dimension	144,100	--	United Kingdom 77,632; France 57,935; Denmark 7,894.
Quartz and quartzite	665,154	16	Spain 423,536; Sweden 227592; Portugal 13,881.
Sand other than metal-bearing	262,561	313	Belgium-Luxembourg 127,147; Sweden 58,903; United Kingdom 39,629.
Sulfur:			
Elemental:			
Crude including native and byproduct	399	--	Switzerland 174; Sweden 133; Austria 58.
Colloidal, precipitated, sublimed	8	--	United Kingdom 7; Saudi Arabia 1.
Dioxide	10,402	--	Sweden 10,393; Germany 9.
Sulfuric acid	28	1	Sweden 15; Netherlands 5; Germany 4.
Talc, steatite, soapstone, pyrophyllite	16,479	(2/)	Sweden 6,960; China 4,779; Finland 2,073.
Vermiculite, perlite, chlorite	2,242	3	Greece 1,201; Denmark 594; Sweden 120.
Other:			
Crude	52,459	329	Germany 40,320; Sweden 7,438; Spain 3,692.
Slag and dross, not metal-bearing	171,320	26	France 97,107; Denmark 36,643; Finland 12,824.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	1,680	74	United Kingdom 522; Sweden 294; Germany 289.
Coal:			
Anthracite	83,151	16,706	Belgium-Luxembourg 29,129; United Kingdom 19,882; Germany 16,999.
Bituminous	706,034	66,980	Poland 160,962; Netherlands 144,763; Colombia 124,645.
Briquets of anthracite and bituminous coal	2,132	21	United Kingdom 2,054; Argentina 47; Sweden 10.
Lignite including briquets	40,755	--	Belgium-Luxembourg 19,880; Poland 12,072; United Kingdom 6,790.
Coke and semicoke	596,994	44,516	United Kingdom 225,759; China 113,158; Poland 79,355.
Gas, natural: Liquefied	71,483	--	United Kingdom 71,147; Finland 208; Germany 64.
Peat including briquets and litter	17,195	--	Sweden 16,020; Denmark 446; Finland 437.
Petroleum:			
Crude thousand tons	1,333	--	United Kingdom 629; Denmark 614; Russia 90.
Refinery products:			
Liquefied petroleum gas	670	320	Denmark 170; Sweden 63; Italy 58.
Gasoline	517,702	36	Sweden 340,310; Denmark 101,005; United Kingdom 36,253.
Mineral jelly and wax	11,922	1,797	Germany 7,016; United Kingdom 990; Finland 899.
Kerosene and jet fuel	127,366	13	Russia 45,224; Sweden 32,264; United Kingdom 11,999.
Distillate fuel oil	520,303	(2/)	Sweden 235,032; Germany 96,099; Russia 70,288.
Lubricants	118,362	1,553	Sweden 37,467; United Kingdom 30,019; France 16,163.
Residual fuel oil thousand tons	1,074	(2/)	Sweden 276; United Kingdom 209; Germany 205.
Bitumen and other residues	341,195	--	Sweden 225,074; France 56,418; Netherlands 20,778.
Bituminous mixtures	1,921	50	Germany 459; United Kingdom 405; France 403.
Petroleum coke	370,240	171,294	United Kingdom 92,878; Belgium-Luxembourg 76,802; Netherlands 9,849.

1/ Table prepared by Glenn J. Wallace.

2/ Less than 1/2 unit.

3/ May include high-purity silicon.

4/ Includes zinc dust, flakes, and powders.

5/ Reported under SITC item number as "selenium, tellurium, phosphorus, arsenic, etc."

Source: United Nations Statistical Office (microfiche).

THE MINERAL INDUSTRY OF

POLAND

By Walter G. Steblez

In 1997, Poland was the second largest producer of copper in Europe and Central Eurasia and ranked among the top 10 world producers of copper in terms of mine output and refined metal production (U.S. Geological Survey, 1998, p. 52-53). Poland also was among the world's major producers of silver and sulfur. The country was one of the region's largest mine producers of lead and zinc, as well as a leading European and Central Eurasian producer of lime, nitrogen (in ammonia), and salt (U.S. Geological Survey, 1997). With respect to mineral fuels, the country remained a major producer of bituminous coal, accounting for about 4% of world output in 1996.

In 1997, Poland's economy remained robust. According to the latest data, the gross domestic product in 1997 grew at a rate of 6.9% compared with that of 1996. Also, the total value of industrial production rose by 9.7% compared with that of 1996. The aggregated values of output of nonfuel mining and quarrying remained at approximately the level of output of 1996. The value of the combined mine output of bituminous coal, lignite, and peat also remained at the 1996 production level. Sales by the nonfuel mining and quarrying sector, however, declined by 1.3%, and those of bituminous coal, lignite, and peat production, by 2.7% despite the overall increase of 2.7% in the total value of sales by industry in 1997 compared with those of 1996. (Główny Urzad Statystyczny, 1997, p. 20, 31, and 119-121).

Major activities in the minerals industry in 1997 included the privatization of Kombinat Gorniczo Hutniczy Miedi Polska Miedz S.A. (KGHM), Poland's producer of mined copper and refined copper metal, and further foreign investment in the country's cement sector.

Poland's sole producer of primary aluminum was the Huta Aluminium "Konin" S.A. smelter at Konin. The plant produced three grades of primary metal from imported alumina. Konin's current capacity was rated to be in excess of 52,000 metric tons (t) (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 11-16). Although Konin's overall modernization program had fallen significantly behind schedule, the upgrading of the company's environmental technology was sufficient to have removed the facility from Poland's list of industrial polluters (Ministry of Environmental Protection, Natural Resources, and Forestry, 1998, p. 12). In addition to primary aluminum produced at Konin, secondary aluminum, as ingots, was produced at Zaklady Metali Lekkich "Kety" SA, Zaklady Metalurgiczne "Skawina," and Zaklady Metalurgiczne "Trzebinia."

Poland was second only to Russia as the largest mine producer of copper in the European and the Central Eurasian regions. In terms of world output in 1997, Poland ranked among the top 10 copper-producing countries (U.S. Geological Survey, 1998, p. 52-53). The production of electrolytically refined copper, the dominant component in the country's refined copper production, increased by 3.8% compared with that of 1996 (Główny Urzad Statystyczny, 1998, p. 125). Exports of unwrought copper and copper alloys in 1996 amounted to 208,500 t (apparently included refined copper scrap), an increase of almost 3% compared with those of 1995. Exports of wrought copper and copper alloys, however, fell short of the export level of 1995 by about 6% (Główny Urzad Statystyczny, 1996, p. 136; 1997, p. 196). In 1996, France, Germany, and the United Kingdom were the principal recipients of refined copper, receiving 45,500, 29,400, and 87,800 t, respectively (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 131-144).

In early 1997, the Government of Poland indicated that the privatization of KGHM was to begin in June, with the estimated value of the tendered shares to amount to be more than US$500 million (Mining Journal, 1997a). The Government planned to sell and distribute 51% of the company's stock (200 million shares)—36% of the stock (72 million shares) would be sold, and 15% of the stock (30 million shares) would be distributed to employees. The public offering (72 million shares) included 20 million shares for domestic sales, 35 million shared for the international market, 7 million shares to international coordinators in case of overallotment, and 10 million shares for addition to the public offering in case of higher than expected demand. The Government-owned residual would amount to 49% (Mining Journal, 1997b).

KGHM operated three mines (Lubin, Polkowice-Sieroszowice, and Rudna), three smelters and refineries (Glogow I, Glogow II, and Legnica), and the Cedynia rolling mill at Orsk. The total surface area of the three contiguous mines amounted to about 412 square kilometers. The ore deposits are hosted in a sedimentary formation dipping 4 to 5 degrees to the northwest (Lubin-Rudna). The main mining area is in the southwestern part of the country where ore is found in the Kupfershiefer stratum, which extends from Germany. Chalcocite is the principal mineral, but there also are lesser amounts of bornite and chalcopyrite. The mineralization is mainly in the shale strata, although it also extends into the overlaying carbonate and underlaying sandstone layers (Cifford, 1997). Total reserves as of December 31, 1996, amounted to 2.29 billion metric tons of ore (Gt) containing 44.14 million metric tons (Mt) of copper. The portion of reserves under exploitation in 1997 was composed of 1.73 Gt of ore containing 33.05 Mt of copper (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 133).

The Rudna Mine produces ore with an average copper (Cu) content of 3% (1997). At the work face, the dolomitic top layer has an average content of 3% Cu, the shale layer hosts up to 15%

Cu, and the lower sandstone layer hosts an average 2% Cu (Miroslaw Bilinski, Technical Director, Rudna Mine, KGHM, Polska Miedz S.A., oral commun., September 19, 1997). Selected data for 1996 for the three mines are given in table 2.

With the aim of streamlining operations, KGHM planned to reduce operating costs from US$1,943 per metric ton of copper in 1997 to $1,435 per ton copper in 2000. The U.S. investment firm Merrill Lynch & Co., Inc. calculated that wages, raw materials (including energy), and repairs will be 33%, 34%, and 7%, respectively, of total costs (Reuters Limited, 1997a). The company also planned to invest about US$2.5 billion during a 5-year period to modernize and increase production. KGHM's investment program for 1997 called for an increase in outlays of 27% compared with those of 1996 (US$200 million compared with US$157 million in 1996), which included plans for constructing a desulfurization plant at Glogow worth 100 million zlotys (about $US29 million) (Mining Journal, 1997d).

In 1997, KGHM's international commercial activities included plans to invest US$54 million in mine development in the Democratic Republic of the Congo (formerly Zaire) to mine cobalt and copper deposits; of this amount, US$19 million was to be invested in 1997. KGHM was studying investment opportunities in China, India, and a number of other African countries (Reuters Limited, 1997c).

During the year, KGHM initiated exploration work for gold in the Zloty Stok (Golden Slope) area of Jelenia Gora Province. Mine development would be started in 1998, provided the resources in the area prove to be economic (Mining Journal, 1997c).

In 1997, Poland remained a major Central European producer of steel. The production of crude steel amounted to more than 11.5 Mt; finished hot-rolled steel products, more than 9.2 Mt; and steel pipes, more than 500,000 t. Also, production in these categories, compared with that of 1996, increased by about 11%, 9%, and 1%. The recovery in the steel sector was consonant with the continuing growth of Poland's economy (Główny Urzad Statystycny, 1998).

The latest available foreign trade data (1996) show that imports of iron ore and concentrates amounted to about 9.8 Mt, a decline of about 10% compared with those of 1995. The countries of the former Soviet Union (FSU) continued to be the major sources of feedstock to Poland's steel mills. In 1996, Russia and Ukraine supplied Poland with iron ores and concentrates, including roasted pyrites, valued at US$153 million and US$60 million, respectively, or about 77% of the total value of Poland's imports of iron ore and concentrate during the year (Główny Urzad Statystycny, 1996, 1997); Poland stopped mining iron ore in 1990. The FSU also was Poland's major source of ferroalloys with exports from Russia, Ukraine, and Kazakstan valued at US$11.7 million, US$10.1 million, and US$0.5 million, respectively, or about 47% of the value of total imports (Główny Urzad Statystycny, 1997). In 1996, Poland's apparent consumption of steel decreased by about 12%, from 11.9 to 10.4 Mt. With the exception of the vanadium-bearing titanomagnetite deposits at Suwalki (Krzemianka and Urdyn deposits), Poland's Ministry of Environmental Protection, Natural Resources and Forestry had removed all the country's sedimentary iron ore deposits from its domestic raw materials register. These deposits (siderite and limonite at Czestochowa and Leczyca), however, were no longer viewed as economic mineral resources (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 249-262).

Poland's steel industry continued to experience trade difficulties with the European Union (EU), especially in view of the country's planned accession to the EU. The EU's European Commission demanded that Poland's earlier agreement to lower tariffs on steel imports and to restructure the steel industry be carried out. Poland had agreed to implement a reduction of tariffs on steel entering the country from 9% to 6% in 1997 and from 6% to 3% in 1998. This goal was not achieved, however, and Poland and the EU agreed to let the 9% tariff stand for 1997, provided that it is reduced to 3% the following year. There remained some concern on the part of the EU that the 3% goal would not be reached and that this could result in further trade disputes (Smith, 1997).

Trade issues also arose during the year with respect to steel exports from Huta Katowice SA to Thailand. Thai trade officials alleged the dumping of steel on the Thai market by Huta Katowice. In appealing the charges, inter alia, representatives of Huta Katowice pointing out that the steel involved in the allegation, which was claimed to cost US$500 per ton to produce and which was alleged to have been sold on the Thai market for US$265, actually represented two different steel products. The value of Huta Katowice's exports to the Thai market in 1996 amounted to US$40 million (Reuters Limited, 1997b).

In 1997, work continued on reducing the steel industry's open-hearth steelmaking capacity. During the first 6 months, Poland's total open-hearth capacity declined to 9.1% of total steel-producing capacity compared with 10.2% during the same period in 1996. Work in this area in 1997 included the installation of a 25-t electric arc furnace (EAF) and ladle furnace at Huta "Batory" SA, which already operated three 9-t EAF's. Installation of a 100-t EAF also continued at P.P. Huta "Czestochowa," and a 85-t EAF at Huta LW sp z.o.o. (Huta Lucchini-Warszawa) was commissioned. Huta Lucchini-Warszawa already operated five 50-t EAF's (Iron & Steelmaker, 1998). Work continued on raising the steel industry's level of continuous casting, which amounted to 21.3% of total steel production in 1996, a low level relative to other European states. In 1997, Huta Lucchini-Warsawa commissioned a continuous caster and Huta Katowice conducted installation work on its second 1.2 million-metric-ton-per-year (Mt/yr) continuous caster and a 1-Mt/yr unit also was under construction at Huta "Ostrowiec" SA (Iron & Steelmaker, 1998).

Lead and zinc ore was mined at two underground mines in the southeastern part of the country. The Olkusz-Pomorzany Mine, near Olkusz, part of the Boleslaw operation, produced ore grading about 1.2% lead and 3.5% zinc, and the Trzebionka Mine and concentrator, at Trzebionka, produced ore grading 1.7% lead and 3.53% zinc (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 276 and 524). About 70,000 metric tons per year (t/yr) of lead and 160,000 t/yr of zinc are produced. In recent years, Switzerland has been the major importer of both metals.

In Poland, four deposits in Lower Silesia compose the country's barium reserve base, which, as of December 31, 1996, was estimated to be 6.14 Mt of barium sulfate. In recent years, production has come from the Boguszow and the Stanislawow deposits, worked by Kopalnia Barytu "Boguszow" Sp. z.o.o. (the Boguszow Mine). After several years of financial difficulty owing to strong foreign competition, low sales, and growing production costs, the Boguszow Mine filed for bankruptcy in 1997. Barite production amounted to about 6,000 t in 1996, but Poland's consumption was in excess of 10,000 t (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 36).

Salient activities in Poland's cement industry during the year involved the acquisition of 60% of the shares of Cementownia "Groszowice" Sp. z.o.o. by CBR of Belgium, a subsidiary of Heidelberger Zement of Germany. The purchase of Cementonia "Groszowice" from Poland's National Investment Fund was accomplished through CBR's Polish subsidiary cement producer, ZCW Gorazdze (Industrial Minerals, 1997c). In a similar move, CBR had acquired a 60% stake in Zielonogorskie Kopalnie Surowcow Mineralnych earlier in the year to secure 15 quarries and 6 deposits of mostly limestone reserves to provide feedstock to its cement operation in Poland (Industrial Minerals, 1997a).

Additional foreign investment in Poland's cement industry in 1997 involved the purchase 34.3% of the shares in Cementownia Chelm SA (Chelm) by Rugby Group PLC of the United Kingdom (Rugby). Rugby also received the option to increase its holdings in Chelm to 75% during the subsequent 3 years. The initial purchase of stock was valued at US$24.8 million. Chelm, in the southeastern part of the country near Lublin, used four wet kilns and has the capacity to produce 2 Mt/yr of cement. A new dry process production line, valued US$ 58 million, with a capacity of 1.6 Mt/yr of cement was scheduled for completion in mid-1999 (Industrial Minerals, 1997e).

Bentonite deposits are rare in Poland. Most deposits pertain to sub-bentonites or bentonite clays that contain lesser amounts of montmorillonite. These deposits occur in the Carpathian Mountains, the Carpathian Foredeep strata, the Upper Silesian Coal Basin, and Lower Silesia (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 47-52). Montmorillonite clays occur with hard coal deposits in coal mines at Sosnowiec-Milowice and at Bytom-Radzionkow in the Upper Silesian Coal Basin. In Lower Silesia, bentonite was discovered in the weathered cover of basalts. Bentonite shales occur in the Carpathian Mountains in Trepcza and in slates at the Polany deposit near Gorlice. Bentonite clays also are found in the northern part of the Carpathian Foredeep strata in the Gorki and the Jawor deposits, near Chmielnik. Montmorillonite clays were produced by the Saturn hard coal mine in Upper Silesia until 1992. In 1997, bentonite was produced entirely from the Krzeniow bentonite deposit in Wikow, worked by the "Bazalt" Mining and Production Plant. Production at this deposit began in 1991.

Kaolinite, a two-layer hydrous aluminum silicate, is the chief mineral found in kaolin. Also known as "china clay," kaolin has a wide range of applications that include the manufacture of paper, paint, rubber, plastics, and ceramics. In Poland, deposits of kaolin occur in the Strzegom-Sobotka and the Strzelin-Otmuchow granitic massifs in Lower Silesia. The chief producer of kaolin in Poland is KSM "Surmin-Kaolin" S.A., working the Maria III deposit in the Nowogrodiec region (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 267-273). To meet the country's rising domestic demand, the production of washed kaolin has been rising steadily from about 42,000 t in 1992 to more than 70,000 t in 1996 (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 269).

Fire or refractory clay, a "detrital material, either plastic or rocklike, containing low percentages of iron oxide, lime magnesia, and alkalies "can withstand temperatures in excess of 1,500° C (U.S. Bureau of Mines, 1980, p. 184-185)." These clays are fabricated into refractory brick and block, as well as other high-temperature products. In Poland, deposits of fire clays are found in Lower Silesia and in the northeastern part of the Swietokrzyskie Mountains. The Jaroszow fire clay deposits in the Strzegom area of Lower Silesia are Poland's main fire clay resources. The Rusko-Jaroszow deposit is the principal source of material in this area and the only one under exploitation in 1997. The deposit was worked by the JARO Refractory Materials Mining and Processing Plants Joint Stock Co. of Jaroszow (JARO). The company accounted for about 85% (1996) of total fire clay production in Poland (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 111). In 1997, JARO began to produce a new chamotte aggregate, which was divided into three grades. The material was to be sold to cement, glass, electric-power- generation, and metals-producing industries (Industrial Minerals, 1997d).

The Badger Mining Corp. of the United States constructed a new plant for processing high-grade industrial silica in the Tomaszow Mazowiecki area. The new plant, Badger Mining Poland Sp. z.o.o., was 100% owned and operated by Badger. The plant's rated capacity was 200,000 t/yr of silica. The feedstock came entirely from a nearby deposit mined by Zero Trans with whom Badger signed a supply agreement (Industrial Minerals, 1997b).

Poland remained a major world producer of bituminous coal, with most production centered in the Upper Silesian Coal Basin. Significantly lesser amounts of coal also were produced in the Lower Silesia and the Lublin Coal Basins.

The Upper Silesian Coal Basin consisted of 104 deposits with reserves amounting to about 49,476 Mt. In 1995, 59 underground mines were reported as being operational. These deposits contain mainly bituminous and sub-bituminous steam coal; coking coal and anthracite also are mined. Low-quality coal [low calorific value, high ash (20%) and sulfur (2%) content] was mined in the eastern part of the basin, but this product was of lesser marketability. The western and northern parts of the basin contain coal of high average calorific value [6300 kilocalories per kilogram (kcal/kg)] low average moisture (3.8%) with low average sulfur (1.3%) and ash values (13%) (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 231-239). The Upper Silesian Coal Basin accounted for more than 97% of the country's total hard coal output. In March 1993, 49 mines in the Upper Silesian Coal Basin were organized into six coal companies as part of the restructuring process of the coal industry.

The Lower Silesian Coal Basin was almost exhausted. Potentially exploitable resources amounted to 151 Mt as of

December 31, 1996. "Reserves" have been determined to be 4.7 Mt. The complex conditions and depletion of reserves have resulted in the decision to close most coal mining operations in the basin. Owing to exploitable deposits of coking coal and anthracite in the basin, however, sections of the Chrobry and the Victoria deposits were combined to form the Walbrzych-Gaj anthracite deposit in 1992. Commercially exploitable resources at this deposit amount to about 42.4 Mt, which included 20.9 Mt of reserves (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 231-239).

The Lublin Coal Basin, in the easternmost coal mining region of Poland, had 12 deposits; as of December 31, 1996, total exploitable resources amounted to 8,710 Mt, mostly steam coal. Owing to complex geologic and difficult mining conditions, only 332 Mt was classified as exploitable reserves. Calorific values of coal from the Lublin Coal Basin range from 4,100 to 7,500 kcal/kg, with an average value of 6,200 kcal/kg. The ash and sulfur contained in the coal amounted to 21.4% and 1.09%, respectively (Ministry of Environmental Protection, Natural Resources and Forestry, 1998, p. 231-239).

Because of their developed infrastructures and operations, and abundant mineral resources, Poland's coal, copper, lead and zinc, and sulfur mining industries should be able to continue operations into the foreseeable future. The need for newer, more expanded commercial infrastructure should continue to stimulate the growth of the country's industrial minerals sector for the production of cement, construction materials, and steel.

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TABLE 1
POLAND: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/		1993	1994	1995	1996	1997
METALS						
Aluminum metal, primary		46,942	49,509	55,728	51,900 r/	53,614
Alumina, nonmetallurgical (<30% Al2O3) e/		200	--	--	--	-- e/
Cadmium metal, primary		149	61	--	-- r/	22
Copper:						
Ore:						
Gross weight	thousand tons	27,113	26,136	26,463	27,427	26,165
Metal content		430,800	423,600	431,100	472,600 r/	464,600
Concentrate:						
Gross weight	thousand tons	1,559	1,494	1,507	1,600 r/ e/	1,650 e/
Metal content		382,800	378,200	384,200	421,900 r/	414,800
Metal:						
Smelter:						
Primary e/		396,000	390,000	395,000	410,000	415,500
Secondary e/		16,000	14,000	15,000	4,800	15,000
Total 3/		412,000	404,000	410,000	414,800	430,500
Refined, primary and secondary		404,170	405,093	407,000	425,000	440,600
Gold ,metal, smelter 3/	kilograms	300	628	510	598 r/	435
Iron and steel:						
Pig iron:						
For foundry use	thousand tons	206	204	227	219 r/	263
For steel production	do.	5,899	6,662	7,146	6,321 r/	7,032
Total		6,105	6,866	7,373	6,540 r/	7,295
Ferroalloys:						
Ferrochromium		38,400	8,700	18,300	1,100 r/	6,200
Ferrosilocomanganese		27,000	31,800	20,500	25,000	20,000
Ferromanganese:						
From blast furnaces		56,400	66,300	46,300	59,900 r/	47,500
From electric furnaces		1,100	--	--	-- e/	--
Ferrosilicon		43,100	54,200	70,400	71,800 r/	77,300
Other electric furnace ferroalloys		3,000	2,700	3,000	5,800 r/	8,500
Total electric furnace		112,600	97,400	112,200	103,700 r/	112,000
Steel, crude:						
From open hearth furnaces	thousand tons	1,660	1,631	1,526	1,118 r/	1,057
From oxygen converters	do.	6,162	7,033	7,685	6,757 r/	7,531
From electric furnaces	do.	2,115	2,447	2,677	2,554 r/	2,994
Other	do.	2	2	2	3 r/	2
Total	do.	9,939	11,113	11,890	10,432	11,584
Semimanufactures:						
Hot rolled	do.	7,632	8,595	8,998	8,532 r/	9,295
Cold rolled	do.	1,401	1,611	1,943	1,788 r/	1,982
Pipe	do.	489	503	576	532 r/	538
Lead:						
Pb-Zn ore, gross weight	do.	4,819	4,871	5,040	5,034	4,938
Mine output, Pb content of Pb-Zn ore		68,400	72,200 r/	69,000 r/	74,900 r/	68,800
Mine output, Pb content of Cu ore		39,300	28,500	25,000	38,600	39,000
Total Pb mine content		107,700	100,700	94,000	113,500	107,800
Concentrate, gross weight		67,400	80,300	88,300	85,000 e/	85,000 e/
Pb content		49,100 r/	52,600 r/	59,200 r/	59,800 r/	55,600
Metal:						
Smelter:						
Primary		30,400	30,700	34,800	26,400 r/	29,600
Secondary		35,500	35,700	38,600	43,000 r/	43,700
Total		65,900	66,400	73,400	69,400 r/	73,300
Refined		62,300	61,200 r/	66,421	66,000 r/	64,800
Selenium		20	60	73	73	76
Silver, mine output, Ag content, recoverable		767	1,064	1,001	935	1,038
Zinc:						
Mine output, Zn content		182,600	182,800	183,200	186,500 r/	182,900
Concentrate output, Zn content		150,900	151,000	154,500	159,000 r/	158,300
Metal, refined, including secondary		149,107	157,618	166,421	165,000	172,919

See footnotes at end of table.

TABLE 1--Continued
POLAND: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/		1993	1994	1995	1996	1997
INDUSTRIAL MINERALS						
Barite:						
Crude		20,400	26,600	22,400	21,700 r/	3,400
Beneficiated		8,500	9,100	6,100	6,200 r/	1,000 e/
Cement, hydraulic	thousand tons	12,200	13,834	13,914	13,959 r/	14,910
Clays and clay products, crude:						
Bentonite		9,100	1,100	1,500	1,800	–
Fuller's earth		4,700	5,200	4,800	6,200	6,100
Fire clay	thousand tons	316	319	275	248 r/	199
Kaolin:						
Crude	do.	265	294	269	281 r/	262
Beneficiated	do.	48	53	53	72 r/	84
Diamond, synthetic	thousand carats	98	270	256	206 r/	35
Diatomite		1,500	2,900 r/	2,200	1,700 r/	1,200
Feldspar:						
Run of mine		43,000	46,000	46,000	64,000 r/	75,700
Beneficiated		32,900 r/	41,400 r/	44,100 r/	58,300 r/	75,700
Gypsum and anhydrite, crude 5/	thousand tons	832	1,055	1,023	991 r/	1,035
Lime, hydrated and quicklime	do.	2,584	2,516	2,526	2,363 r/	2,516
Magnesite:						
Ore, crude	do.	34,000	30,000	26,000	21,000 r/	30,000
Concentrate	do.	13,000	16,400	21,500	19,300 r/	6,400
Calcined		1,400	1,500	1,200	800 r/	400
Nitrogen, N content of ammonia	thousand tons	1,163	1,230	1,415	1,405 r/	1,427
Salt:						
Rock	do.	718	750	812	923 r/	791
Other	do.	3,099	3,324	3,402	3,240 r/	3,188
Total	do.	3,817	4,074	4,214	4,163	3,979
Sand, excluding glass sand:						
Foundry sand	do.	669	507	521	1,067 r/	1,034
Filling sand		19,990	18,765	19,067	17,510 r/	14,155
Lime-sand brick production sand	sand cubic meters	1,565	1,453	1,435	1,086 r/	799
Silica:						
Quartz and quartz crystal		55,600	39,900	14,200	55,200 r/	77,600
Quartzite , refractory		128,800	208,000	233,000	294,000 r/	205,000
Quartz schist		11,500	11,400	8,500	6,500 r/	6,518
Glass sand	thousand tons	824	759	874	1,111 r/	1,124
Glass:						
Construction, flat	do.	295	266	327	322 r	426
Technical	do.	44	46	48	52 r/	52
Commercial	do.	48	54	64	67 r/	70
Packing	do.	624	712	777	811 r/	873
Sodium compounds, n.e.s.:						
Carbonate (soda ash), 98%	do.	803 r/	979 r/	1,001 r/	893 r/	933
Caustic soda (96% NaOH)	do.	590 r/	591 r/	653 r/	705 r/	718
Stone:						
Dolomite, mine output	do.	4,776 r/	6,409 r/	8,123 r/	7,109 r/	7,086
Limestone, for lime production	do.	11,075	12,230	12,079	12,764 r/	13,136
Limestone for non- lime end use	do.	23,360	26,760	27,036	26,748 r/	28,201
Crushed and dimension stone, mine output	do.	13,644	16,632 r/	19,780 r/	19,258 r/	21,087
Sulfur:						
Native:						
Frasch	do.	1,861	2,129	2,392	1,733 r/	1,731
Byproduct:						
From metallurgy	do.	210	200	210	200 e/	256
From petroleum	do.	29	34	33	30 e/	44
Total	do.	239	234	243	230 e/	300
From gypsum e/	do.	10	12	12	12	12
Total sulfur e/	do.	2,110	2,375	2,647	1,975 r/	2,043

See footnotes at end of table.

TABLE 1--Continued
POLAND: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/		1993	1994	1995	1996	1997
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Bituminous	do.	130,479	133,933	137,166	137,987 r/	137,952
Lignite and brown	do.	68,105	66,770	63,547	63,845	63,169
Total	do.	198,584	200,703	200,713	201,832	201,121
Coke:						
Coke oven	do.	10,275	11,454	11,579	10,340	10,532
Gashouse	do.	7	2	--	--	--
Total	do.	10,282	11,456	11,579	10,340	10,532
Fuel briquets, all grades	do.	102	99	110 r/	96 r/	80
Gas:						
Natural	million cubic meters	4,949	4,635	4,803	4,754	4,725
Manufactured:						
Town gas	do.	14	15	33	16 r/	10
Coke oven gas	do.	4,077	4,840	4,872	4,247 r/	4,414
Generator gas	do.	554	399	400 e/	400 e/	400 e/
Total	do.	4,645	5,254	5,305	4,663 r/	4,824 e/
Natural gas liquids, e/	thousand 42-gallon barrels	30	30	30	30	30 e/
Peat, fuel and agricultural	thousand tons	110	109	199	198 r/	206
Petroleum:						
Crude, as reported	do.	235	284	292	317	289
Refinery products 6/	do.	27,169	27,795	28,435	30,000 e/	14,885

e/ Estimated. r/ Revised.

1/ Table includes data available through October 1999.

2/ In addition to the commodities listed above, antimony and germanium, associated with polymetallic deposits, and cobalt and nickel, associated with copper ores, are produced in quantities that so far have not warranted further recovery.

3/ Reported figure.

4/ Based on official Polish estimates.

5/ Includes building gypsum, as well as an estimate for gypsum used in the production of cement.

6/ Includes virtually all major products.

TABLE 2
POLAND: SELECTED DATA ON POLAND'S COPPER MINING INDUSTRY IN 1996

Principal Mines		Rudna	Lubin	Polkowice-Sieroszowice
Mine Production:				
Ore mined	million metric tons	10.39	6.36	9.24
Copper grade	percent	2.08	1.36	1.84
Silver grade	grams per metric ton	49	73	34
Beneficiation				
Plant production:				
Concentrate	thousand metric tons	749	417	487
Copper grade	percent	28.6	18.7	26.7
Copper recovery	percent	89.3	90	88.7
Silver grade	grams per metric ton	629	976	456
Silver recovery	percent	84.4	87.5	82.9
Unit mining cost:				
US$ per metric ton		0.39	0.47	0.43

Source: Des Clifford, 1997, KGHM Polska Miedz Europe's copper giant: Mining Magazine (Mining Journal, London), August, p. 119.

TABLE 3
POLAND: STRUCTURE OF THE MINERAL INDUSTRY IN 1997 1/

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Aluminum:			
Primary	Huta Aluminium "Konin" S.A.	Konin	50.
Secondary	Zaklady Metalurgiczne "Skawina"	Skawina	20.
	Zaklady Metali Lekkich SA "Kety"	Kety	
	Zaklady Metalurgiezne "Trzebinia"	Trzebinia	
Barite	Kopalnia Barytu "Buguszow" Sp. Z o.o	Boguszow, Stanislawow	40.
Cement	20 cement plants (in order of size): Gorazdze, Ozarow, Chelm, Warta, Malogoszcz, Nowiny, Strzelce Opolskie, Kujawy, Rudniki, Wierbica, Nowa Huta, Rejowice, Odra, Warszawa, Groszowice, Polcement-Saturn, Wysoka, Cem-Con, Wick, Wejherowo	Primarily in southern Poland. Kujawy, Warszawa, Cem-Con and Wejherowo are in Central and northern Poland.	16,000.
Coal:			
Anthracite	Zaklad Wydobywczo Przetworczy Antracytu Walbrzych-Gaj	Lower Silesia	200.
Bituminous	Bytomska Spolka Weglowa S.A.	Upper Silesia (9 mines)	140,000.
	Rudzka Spolka Weglowa S.A.	do. (6 mines)	
	Gliwicka Spolka Weglowa S.A.	do. (7 mines)	
	Katowicki Holding Weglowy S.A.	do. (11 mines)	
	Nadwislanska Spolka Weglowa S.A.	do. (8 mines)	
	Rybnicka Spolka Weglowa S.A.	do. (5 mines)	
	Jastrzebska Spolka Weglowa S.A.	do. (6 mines)	
	Seven independent mines	do.	
	Walbrzyskie Kopalnie Wegla Kamiennego	Lower Silesia	
	KWK "Nowa Ruda"	do.	
	KWK "Bogdanka" S.A.	do.	
Lignite	KWK "Belchatow"	Belchatow	75,000.
	KWK "Turow"	Turow	
	KWK "Konin"	Konin	
	KWK "Adamow"	Adamow	
	KWK "Sieniawa"	Sieniawa	
Coke	Zaklady Koksownicze im. Powstancow Sl.	Upper Silesia	12,000.
	Zaklady Koksownicze "Przyjazn"	do.	
	Kombinat Koksochemiczny "Zabrze"	do.	
	Huta im. Sendzimira	do. (Krakow)	
	Huta "Czestochowa"	do. (Czestochowa)	
	Zaklady Koksownicze "Walbrzych"	Lower Silesia	
Copper:			
Concentrate, gross weight			
	Kombinat Gorniczo Hutniczy Miedzi (KGHM) Polska Miedz S.A.	Mines and concentrators at Konrad, Lubin, Polkowice, Rudna, and Sieroszowice	1,900. (385 Cu)
Metal, refined	do.	Refineries at Glogow I, Glogow II, and Legnica	415.
Feldspar	Strzeblowskie Kopalnie Surowcow Mineralnych	Mine at Sobotka, Lower Silesia, workings at Pagorki Zachodnie and Pagorki Wschodnie	50.
Ferroalloys:			
Electric furnace (FeSiMn, FeMn, FeCr, FeSi)	Huta "Laziska"	Upper Silesia at Laziska Gorne	170.
Blast furnace (FeMn)	Huta "Pokoj" S.A.	Upper Silesia, Ruda Slaska	90.
Gold (kilograms)	KGHM "Polska Miedz" S.A.	Refinery at Glogow "Trzebinia"	550.
Gypsum and anhydrite	Zaklady Przemyslu Gipsowego "Dolina Nidy"	Southeastern Poland, Gacki	1,400.
	Zaklad Gipsowy "Stawiany"	Southeastern Poland, Szarbkow	
	Kopalnia Anhydrytu "Nowy Lad"	Lower Silesia, Niwnice	
	KGHM "Polska Miedz" S.A.	Lower Silesia, Iwiny	
Helium million cubic meters	Zaklad Odazotowania Gazu	Western Poland, Odolanow	3.

See footnotes at end of table.

TABLE 3--Continued
POLAND: STRUCTURE OF THE MINERAL INDUSTRY IN 1997 1/

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Kaolin	KSM "Surmin-Kaolin" S.A.	Lower Silesia, Nowogrodziec	50.
Lead-zinc:			
Concentrate	Zaklady Gorniczo-Hutnicze "Boleslaw"	Mines and concentrators at Olkusz and Pomorzany, Bukowno region	60 Pb, 160 Zn.
	Zaklady Gornicze "Trzebionka" S.A.	Mines and concentrator at Trzebinia	
Metal:			
Pb, refined	Huta Cynku "Miasteczko Slaskie"	Refinery at Miasteczko Slaskie	60.
Do.	Huta Metali Niezelaznych "Szopienice"	Katowice	35.
Zn, refined	Huta Cynku "Miasteczko Slaskie"	Imperial Smelter at Miasteczko Slaskie	60.
Do.	Zaklady Metalurgiczny "Silesia" (input from Huta "Miasteczko Slaskie")	Refinery at Katowice	(30).
Do.	Zaklady Gorniczo-Hutnicze "Boleslaw"	Refinery at Boleslaw	65.
Do.	Huta Metali Niezelaznych "Szopienice"	Katowice	28.
Lime	In order of size:		4,500.
	Zaklady Przemyslu Wapienniczego Trzuskawica	Kieleckie County, Swietokrzyskie Mountains	
	Slaskie Zaklady Przemyslu Wapienniczego Opolwap S.A.	Opole County	
	Zaklady Przemyslu Wapienniczego Bukowa	Kieleckie County, Swietokrzyskie Mountains	
	Kombinat Cementowo-Wapienniczy Kujawy S.A.	Bydgoskie County	
	Zaklady Cementowo-Wapiennicze Gorazdze S.A.	Opole County	
	Zaklady Cementowo-Wapiennicze Nowiny	Kieleckie County	
	Produkcyjno-Handlowo-Uslugowe Wapmo-Sabinow	Czestochowa County	
	Wojcieszowskie Zaklady Przemyslu Wapienniczego Sp. z o.o.	Jeleniogorskie County	
	Zaklady Przemyslu Wapienniczego w Sulejowie	Piotrkowskie County	
	Zaklad Wapienniczy w Plazie	Katowickie County	
Natural gas (million cubic meters)	Ministry of Mining and Energy	Gasfields at pre-Carpathian foothills Carpathian Mountains Lowlands, near Ostrow Wielkopolski, Poznan, and Trzebnica, north of Wroclaw	4,900.
Nitrogen:			2,400.
Ammonia (NH3)	Zaklady Azotowe "Pulawy" S.A.	Pulawy in eastern Poland	
	Zaklady Azotowe "Kedzierzyn" S.A.	Kedzierzyn in Upper Silesia	
	Zaklady Azotowe "Wloclawek" S.A.	Wloclawek in central Poland	
	Zaklady Azotowe S.A. w Tarnowie	Tarnow in southern Poland	
	Zaklady Azotowe S.A. w Chorzowie	Chorzow in Upper Silesia	
	Zaklady Chemiezne "Police"	Police in northwest Poland	
Fertilizer (N)	do.	do.	1,700.
Petroleum :			
Crude	Polskie Gornicstwo Naftowe i Gazownictwo Warszawa	Oilfields in northern and northwestern lowlands; sub-Carpathian region and Carpathian Mountains	200.
Do.	Predsiebiorstwo Poszukiwan i Eksploatacji Rpy i Gazu "Petrobaltic"	Baltic Sea Shelf	100.
Refined	"Petrochimia-Plock"	Plock in central Poland	13,500.
	Rafineria "Gdansk"	Gdansk in northern Poland	
	Rafineria "Chechowice"	Czechowice in southern Poland	
	Rafineria "Trzebinia"	Trzebinia in southern Poland	
	Rafineria "Glimar" Gorilice	Gorilice in southern Poland	
	Rafineria "Jedlicze"	Jedlicze in southern Poland	
	Podkarpackie Zaklady Rafyneryjne w Jasle	Jaslo in southern Poland	

See footnotes at end of table.

TABLE 3--Continued
POLAND: STRUCTURE OF THE MINERAL INDUSTRY IN 1997 1/

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Salt, all types			6,500.
	Inowroclawskie Kopalnie Soli S.A.	Gora, Mogilno I, and Mogilno II mines at Inowroclaw in central Poland	
	Kopalnia Soli "Klodawa"	Klodawa in central Poland	
	Kopalnia Soli "Wieliczka"	Wieliczka in southern Poland, near Krakow, mining deposits at Barycz and Wieliczka	
	Kopalnia Soli "Bochnia"	Southern Poland, mines at the Lezkowice and Siedlec-Moszczenica-Lapczyca deposit. Not known to have operate in 1996	
	KGHM "Polska Miedz" S.A.	Sieroszowice in southwestern Poland	
	Kopalnia Wegla Kamiennego "Debiensko"	Debiensko, Upper Silesia	
	Janikowskie Zaklady Sodowe "Janikosoda" S.A.	Janikowo in central Poland	
Selenium	Huta Metali Niezelaznych 'Szopienice"	Katowice	80.
	KGHM "Polska Miedz" S.A.	Refinery at Glogow	
Silver	KGHM "Polska Miedz" S.A. Zaklady Metalurgiczne Trzebinia	Refined from dore produced by the Szopienice Pn-Zn smelter-refinery largely from KGHM supplied slimes	1.
Steel:			14,000 (crude).
Crude and semimanufactures	Huta "Katowice" S.A.	Plant at Dobrowa Gornicza, producing pig iron, crude steel, hot rolled- products, and cast steel	
	P.P. Huta im. T. Sendzimir	Steelworks at Krakow, producing pig iron, crude steel, hot-rolled products, cold-rolled products, pipes, and cast iron	
	P.P. Huta "Zawierciu"	Steelworks at Zawierciu, producing crude steel, hot rolled products, cast iron, and cast steel	
	P.P. Huta "Czestochowa"	Steelworks at Czestochowa, producing pig iron, crude steel, hot rolled sheets, pipes, and cast iron	
	Huta "Ostrowiec" S.A.	Steelworks at Ostrowiec-Swietokrzyski, producing crude steel, hot rolled products	
	P.P. Huta "Labedy"	Steelworks at Gliwice, producing crude steel, and hot-rolled products	
	Huta "Lucchini-Warszawa" Sp. z o.o.	Steelworks in Warsaw, producing crude steel, hot-rolled products, and cold-rolled strip	
	P.P. Huta "Florian"	Steelworks in Swietochlowicach, producing crude steel, hot-rolled products, galvanized sheet, and cold-rolled strip	
	Huta "Stalowa Wola" S.A.	Steelworks at Stalowa Wola, producing crude steel,	
	Huta "Jednosc" S.A	Steelworks at Siemianowice Slaskie, producing crude steel, hot-rolled products, and pipes	
	Huta "Batory" S.A.	Steelworks at Chorzow, producing crude steel, hot-rolled products, and pipes	
	P.P.Huta "Baildon"	Steelworks in Katowice, producing crude steel, hot-rolled products, cold-rolled strip, and cast steel	
	Huta "Malapanew" S.A.	Steelworks at Ozimek, producing crude steel and cast steel	
	Huta "Zabrze" S.A.	Steelworks at Zabrze, producing crude steel, cast iron, and cast steel	
	Huta "Zygmunt" S.A.	Steelworks at Bytom, producing crude steel, cast iron, and crude steel	

See footnotes at end of table.

TABLE 3--Continued
POLAND: STRUCTURE OF THE MINERAL INDUSTRY IN 1997 1/

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Steel--Continued:			
Semimanufactures only	P.P. Huta im. Cedlera	Steelworks in Sosnowiec, producing hot-rolled products, cold-rolled strip, and cast iron	
	P.P. Huta "Kosciuszko"	Steelworks at Chorzow, producing hot-rolled products	
	Huta "Pokoj" S.A.	Steelworks at Ruda Slaska, producing hot-rolled products	
	Huta "Andrzej" S.A.	Steelworks at Zawadskie, producing pipes	
	Huta "Ferrum" S.A.	Steelworks in Katowice, producing pipes	
	P.P. Huta "Bobrek"	Steelworks in Bytom, producing pig iron, hot-rolled products, and cast iron	
	Huta "Buczek" S.A.	Steelworks in Sosnowiec, producing pipes and cast iron	
	P.P. Huta "1 Maja"	Steelworks in Gliwice, producing hot-rolled products	
	Zaklad Wielkopiecowy "Szczecin" Sp. z o.o.	Steelworks at Szczecin, producing pig iron	
Sulfur	P.P.Kopalne i Zaklady Przetworcze Siarki "Siarkopol"	Operations at Tarnobrzeg, mining the Jeziorko-Grebow-Wydza deposit.	5,700.
	P.P. Kopalnie i Zaklady Chemiczne Siarki "Siarkopol"	Operations at Grzybow, mining the Osiek and Grzybow-Gacki deposits.	

1/ The data presented in this table was compiled, in large measure, from information provided in the Minerals Yearbook of Poland (Bilans Gospodarki (Surowcami Mineralnymi w Polsce Na Tle Gospodarki Swiatowej 1995) prepared and published by the Department of Mineral and Energy Policy, Mineral and Energy Economy Research Centre of the Academy of Sciences of Poland, The Ministry of Environmental Protection, Natural Resources and Forestry. Additionally, very valuable information and criticism was provided by Mr. Krystof Galos and other members of this academic department.

THE MINERAL INDUSTRY OF

PORTUGAL

By Harold R. Newman

Portugal, which shares the Iberian peninsula with Spain, is one of the most mineralized areas of Western Europe and is geologically very complex. The mineral industry of Portugal was modest by world standards; however, its growth rate during the past few years has made minerals one of the country's dynamic industrial sectors. This was mainly because of the discovery and development of the rich copper and tin deposits of Sociedade Mineira de Neves-Corvo S.A. (Somincor) at Neves-Corvo. The country has had a long history of development of metallic minerals and was the largest producer of mined copper in the European Union in 1997.

The Government continued with the country's privatization program and was proceeding with legislation that would privatize many public companies. The privatization issue was part of a broader program to reduce the role of the state and to restructure the Portuguese economy to one that is more market driven.

The Neves-Corvo Mine of Somincor and the Panasqueira tungsten mine of Beralt Tin and Wolfram (Portugal) Ltd. were the two major operations in the metal mining sector. Pirites Alentejanas S.A.R.L. was the country's largest producer of pyrite; Siderúrgia Nacional S.A.R.L. produced iron and steel. Cimentos de Portugal, S.A. (CIMPOR), an important producer of cement, was one of the companies included in the Government's privatization plans. With the exception of copper, ferroalloys, dimension stone, tin, and tungsten, which were of international importance, production of other minerals and related materials had only domestic significance. *(See table 1.)*

Most of the large mineral-resource companies were owned or controlled by the Government, although there were some privately owned operations. *(See table 2.)* About 32,000 people were employed by the mineral industry, including mining and processing.

Somincor was 51% Government owned through the mining conglomerate Empresa de Desenvolvimento Mineiro (EDM). The minority partner was Rio Tinto Ltd. (formerly RTZ Corp.), a UK company that owned 49% of the joint venture. The mine was designed to produce 1.3 million metric tons per year of raw ore to yield 500,000 metric tons per year (t/yr) of concentrate averaging 26% copper content. The estimated life of the mine, based on estimated proven reserves, was 20 years (Richards and others, 1991).

The Neves-Corvo complex consisted of four proven ore bodies—Graca, averaging 10% copper; Corvo, ranging from 7% to 10% copper; Neves, averaging 1% copper; and Zambujal, a complex sulfide ore of copper, lead, and zinc. Zinc and tin also occurs in the other deposits. Recovery of tin-in-concentrate has stabilized at Neves-Corvo at around 5,000 t/yr. Because Neves-Corvo is primarily a copper mining operation, Somincor considers tin to be a byproduct.

Gold exploration activities were continuing in the Jales-Tres Minas gold district by the joint venture of Sociedade des Mines du Bourneix (SMB), a wholly owned subsidiary of Compagnie Générale des Matières Nucléaires of France, and EDM. The area includes the ancient Jales Mine and is located 150 kilometers (km) east of Oporto. SMB was a 70% majority partner in the project. Jales-Tres Minas was probably the most important gold district in Portugal.

Hydrothermal auriferous quartz veins were found along faults cutting the middle to late Paleozoic peraluminous granites and Paleozoic graphite schist, mica schists, quartzites, and greywacke. The subvertical veins strike north northeast to northeast and west southwest, may reach 2.5 km long and range in width from a few centimeters to a meter. Gold and electrum (naturally occurring gold-silver alloy) were found within the quartz and the sulfides, mainly arsenopyrite, chalcopyrite, galena, pyrrhotite, and sphalerite. In the core of the vein, the average gold grade was 37 grams of gold per ton (g/t) of ore but was reduced to 11 g/t over a 1-meter (m) width. Five paragenetic stages with distinct alteration features were identified. The Jales Mine was in production early in this century, and by the close of its operation, the mine had produced more than 25 metric tons (t) of gold and more than 100 t of silver and reached a depth of 630 m. (Neiva and others, 1989).

Auspex Minerals Ltd. announced results of exploration programs underway in Portugal. The Montemor gold concession was the most advanced of the company's four properties. A substantial amount of exploration was conducted by Rio Tinto from 1984 to 1992. Drilling was continuing on the prospect. Auspex reported that there were indicated geologic reserves of 1,135,000 t grading 2.15 g/t gold. The object of the current program was to expand upon the reserve base and to progress to a feasibility study as quickly as possible (Auspex Minerals Ltd., July 1997, Portugal update, accessed August 29, 1997, at URL http://www.auspex-min.com/press/pr960716.htm).

The Portuguese iron and steel operation was nationalized in 1975 to function as a public entity incorporated as Siderúrgia Nacional Empresa de Productos Planos (SN-Planos). The Government changed SN-Planos into a public, limited company as a major step toward privatization.

Beralt Tin and Wolfram (Portugal) Ltd. was the only producer of tungsten in 1997. Beralt was proceeding with development work at the Panasqueira Mine at Barroca Grande to improve efficiency and to increase the life of the mine. Most of the work was directed toward the final treatment of concentrates and toward preparations for the mining of new areas of Level 3. The treatment plant for concentrates was moved to the main zone of operation and modernized to increase capacity and to improve efficiency. Beralt also had a small production of byproduct copper and tin concentrates. The company expected that completion of capital projects underway at its operations in Peru, Portugal, and the United States would take it into the next century as one of the largest and lowest cost producers of tungsten concentrates in the world (Avocet Mining Plc., 1997, Tungsten—Beralt Tin and Wolfram (Portugal) S.A., accessed April 28, 1998, at URL http://www.avocet.co.uk/annual report-review of operations.htm).

Portugal's industrial minerals sector was a modern and efficient producer of a variety of materials, most notably ceramics and dimension stone. The dimension stone industry continued to be an important segment of the mining industry in terms of value and trade.

Marble was the most valuable of the stone products and accounted for the majority of stone production. The main area for marble mining continued to be the District of Evora. There was potential for increased production of granite, marble, and slate.

Demand for cement continued as the building and construction industry maintained its level of activity. This situation was expected to continue with preparations for EXPO 98 in Lisbon and the substantial volume of work in coming years to develop Portugal's infrastructure.

Coal accounted for about 4% of total energy consumption. Most coal was imported although there were some domestic reserves. Empresa Carbonifera de Douro S.A.R.L.'s Germunde Mine at Castello de Pavia closed because of high production costs and difficult mining conditions. Coal demand was growing because the electricity sector was switching from oil to coal. The two major cement producers, CIMPOR and Companhia Geral de Cale Cimento S.A. also used coal as a major fuel source. Portugal had no natural gas reserves and no nuclear powerplants. Hydropower accounted for about 45% of electricity generation. The Government sought to diversify its energy sources and increase electrical power capacity to meet consumption growth.

The transportation network included 3,613 km of railroads, most of which was operated by the state-owned Portuguese Railroad Co. (CPR). Most of the trackage was single-track, 1.665-m gauge, of which about 15% was electrified. CPR was planning to match the European gauge width of 1.433-m on a number of key routes throughout the country. It was expected that this would be done by adding a track to the existing lines.

The Government was planning to invest about $22.4 billion in infrastructure improvements during the next few years. The main thrust would be the modernization of the country's ports. Major seaports were Lisbon, Porto, and Sines. These three ports were considered very important in a country where the main movement of goods was by sea. Other areas to be improved included the highways and bridges of the national motorway network. Portugal had about 74,000 km of usable roadways, of which 84% was paved.

The present structure of the mineral industry could change in the near future because of significant mining exploration by several foreign companies. Copper, gold, kaolin, lead, lithium, pyrites, and tin were some of the minerals targeted for exploration. The Iberian Pyrite Belt (IPB), approximately 60 km wide by 250 km long, extends from the southwestern coast of Portugal near Setubal to the Guadalquivir River near Seville, Spain. This is the prime area for exploration activity.

The IPB could possibly be the oldest known major massive sulfide district to be mined. Archeological evidence shows that pyrite gossans in the area, particularly Sao Joao and Algares at Aljustrel, were exploited by Phoenicians and/or Romans for gold and base metals. Exploration in the IPB would appear to have an above-average potential for success on the basis of the district's record of about 90 documented mineralized deposits, an unusually high number of large sulfide deposits (Auspex Minerals Ltd. 1997, Production and exploration opportunity in Portugal, accessed June 1, 1998, at URL http://www.auspex-min.com projects1.html).

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Major Sources of Information

Cabinete Para Pesquisa e Exploração de Petróleo-MIE
Rue Vale do Pereiro, 4
1200 Lisboa, Portugal
Instituto Geológico e Mineiro
R. Almirante Barroso, 38
1000 Lisboa, Portugal

TABLE 1
PORTUGAL: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
METALS						
Arsenic, white e/		150	125	125	100	100
Beryl concentrate, gross weight e/		4	4	4	4	5
Copper, mine output:						
Cu content		153,797	133,629	134,181	107,773 2/	106,500
Metal, smelter, secondary e/		1,000	--	--	--	--
Iron and steel:						
Iron ore and concentrate:						
Gross weight, manganiferous		16,175	14,330	14,535	18,620	18,000
Fe content, manganiferous		6,114	5,409	5,417	7,876	6,800
Metal:						
Pig iron	thousand tons	398	415	411	421	431 2/
Crude steel	do.	775	749	829	871 r/	860
Lead, refined, secondary e/		8,300	13,000	7,700 r/	5,900 r/	6,000
Manganese, Mn content of iron ore e/		500	500	500	500	500
Silver, mine output, Ag content	kilograms	36,200	31,800	38,600	34,000	34,000
Tin:						
Mine output, Sn content		5,334	4,332	4,627	4,637	4,000
Metal, primary and secondary e/		100	100	100	100	100
Titanium, concentrates: e/						
Gross weight		20	20	--	--	--
Content of TiO2		5	5	--	--	--
Tungsten, mine output, W content		768	73 r/	1,103 r/	776 r/	800
Uranium concentrate, U_3O_8		33	28	22	17	18
Zinc, smelter, primary e/		3,500	4,200	4,000	3,600 r/	3,600
INDUSTRIAL MINERALS						
Barite e/		--	50	--	--	--
Cement, hydraulic	thousand tons	7,600	7,500	7,500	7,200	7,400
Clays:						
Kaolin 3/		178,285	181,933	180,000 e/	177,423	180,000
Refractory e/		300,000	431,967 2/	300,000	392,148	300,000
Diatomite e/		1,860	2,150	1,780	1,550	2,000
Feldspar		90,547	92,440	106,559	98,596	100,000
Gypsum and anhydrite		458,112	450,000 e/	450,000	520,722	450,000
Lime, hydrated and quicklime e/		200,000	200,000	200,000	200,000	200,000
Lithium minerals, lepidolite		13,289	11,352	8,740	7,626	11,000
Nitrogen, N content of ammonia e/		91,000	57,900	155,100	197,600	195,600
Pyrite and pyrrhotite (including cuprous), gross weight		14,000	14,000	12,000	10,000 e/	10,000
Salt:						
Rock		524,540	519,432	544,647	609,639	600,000
Marine e/		125,000	125,000	--	--	--
Total		649,540	644,432	544,647	609,639	600,000
Sand e/		5,000	5,000	5,000	5,127	5,000
Sodium compounds, n.e.s.: e/						
Soda ash		150,000	150,000	150,000	150,000	150,000
Sulfate		50,000	50,000	50,000	50,000	50,000
Stone: e/						
Basalt	thousand tons	100	530	100	100	100
Calcareous:	do.					
Dolomite	do.	500	471 2/	500	510	500
Limestone, marl, calcite	do.	15,000	33,134 2/	15,000	35,370	15,000
Marble	do.	939	935 2/	800	945	900
Diorite	do.	1,000	1,029 2/	1,000	282	1,000
Gabbro	do.	1,000	132 2/	100	147	100

See footnotes at end of table.

TABLE 1--Continued
PORTUGAL: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
INDUSTRIAL MINERALS--Continued						
Stone e/--Continued:						
Granite	thousand tons	8,500	17,360 2/	10,000	252	10,000
Graywacke	do.	20	138 2/	20	60	20
Ophite	do.	50	110	50	50	50
Quartz	do.	9	14 2/	28	14	25
Quartzite	do.	500	526 2/	500	594	500
Schist	do.	100	273 2/	100	260	100
Slate	do.	61	40	30	20	30
Syenite	do.	30	58 2/	25	39	25
Sulfur: e/						
Content of pyrites		5,000	5,000	5,000	5,000	5,000
Byproduct, all sources		4,000	4,000	4,000	4,000	3,000
Total		9,000	9,000	9,000	9,000	8,000
Talc		9,054	8,367	8,400 e/	8,277	8,500
MINERAL FUELS AND RELATED MATERIALS						
Coal, anthracite e/	thousand tons	216 2/	148 2/	140	--	--
Coke, metallurgical e/	do.	150	150	329 r/ 2/	332 r/ 2/	330
Gas, manufactured e/	million cubic meters	125	125	125	125	125
Petroleum refinery products: e/						
Liquefied petroleum gas	thousand 42-gallon barrels	4,500	4,600	4,768 r/ 2/	4,338 r/ 2/	4,500
Gasoline	do.	14,000	15,000	23,826 r/ 2/	21,828 r/ 2/	15,000
Jet fuel	do.	5,000	5,000	8,000 r/ e/	7,500 r/ e/	7,000
Kerosene	do.	225	225	400 r/ e/	400 r/ e/	225
Distillate fuel oil	do.	20,000	20,000	20,000	20,000	20,000
Residual fuel oil	do.	20,000	20,000	20,000	20,000	20,000
All other products	do.	8,800	9,000	9,000	9,000	10,000
Refinery fuel and losses	do.	3,500	3,500	3,500	3,500	3,000
Total	do.	76,025	77,325	89,494 r/	86,566 r/	77,525

e/ Estimated. r/ Revised.

1/ Table includes data available through May 1998.

2/ Reported figure.

3/ Includes washed and unwashed kaolin.

TABLE 2
PORTUGAL: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of facilities	Annual capacity
Cement		Cimentos de Portugal S.A. (CIMPOR) (Government, 100%)	10 plants, various locations	6,000
Coal		Empresa Carbonifera de Douro S.A.R.L. (ECD) (Government, 100%)	Germunde Mine at Castello de Pavia (closed-maintenance standby)	150
Copper concentrate		Sociedade Mineira de Neves-Corvo S.A. (Somincor) (Government, 51%; Rio Tinto Ltd., 49%)	Neves-Corvo Mine near Castro Verde	500
Diatomite		Sociedade Anglo-Portugesa de Diatomite Lda.	Mines at Obidos and Rolica	5
Feldspar		A.J. da Fonseca Lda.	Seixigal Quarry, Chaves	10
Ferroalloys		Electrometalúrgia S.A.R.L.	Plant at Setubal	100
Petroleum, refined	barrels per day	Petroleos de Portugal (Petrogal) (Government 100%)	Refineries at Lisbon, Porto, and Sines	300,000
Pyrite		Pirites Alentejanas S.A.R.L.	Plant at Setubal	100
Steel, crude		Siderurgia Nacional S.A.R.L. (SN) (Government 100%)	Ironworks and steelworks at Seixal and Maia	1,000
Tin		Sociedade Mineira de Neves-Corvo S.A. (Somincor) (Government 51%, Rio Tinto Ltd. , 49%)	Neves-Corvo Mine near Castro Verde	5
Tungsten		Beralt Tin and Wolfram (Portugal) Ltd. (Avocet Mining Plc. 100%)	Panasqueira Mine and plant at Barroca Grande	1,600
Uranium	tons	Empresa Nacional de Uranio (Government 100%)	Mines and plant at Guargia	170
Zinc, refined		Quimigal E.P. (Government 100%)	Electrolytic plant at Barreiro	11

THE MINERAL INDUSTRY OF

ROMANIA

By Walter G. Steblez

Although Romania's economy showed mixed results, in 1997, the country remained a modest regional producer of metals (aluminum, copper, lead and zinc, manganese, and steel and ferroalloys) and industrial minerals and a significant producer of petroleum and natural gas. The growth rates of the gross domestic product (GDP) and industrial production declined by 6.6% and about 6%, respectively, compared with those of 1996. The transition to a market economy, however, remained on course as the private sector share of the GDP amounted to almost 60% during the year. Significant foreign investment activity in Romania's gold and steel sectors constituted the main event in the country's minerals industry.

In 1997, Romania's Government decided to accelerate the reform and rationalization of the country's mining sector. Pending parliamentary review, the draft of the new mining law will be adopted from a bill to a state decree; this decree would provide the Agency for Mineral Resources the right to issue licences to work mining sites for up to 20 years by domestic and foreign investors. The Government of Romania would close unprofitable operations, including petroleum refineries and such state-owned enterprises as coal mining companies, and would end subsidies to the mining sector. Before the state-owned enterprises could be privatized, they would have to be restructured as commercial companies. By 2005, the Government would eliminate 64,000 mining jobs (Industrial Minerals, 1997b); as of October 1997, 40,000 miners has accepted redundancy status. Redundant employees would be given severance pay equivalent to 12 months of average wages (Reuters Limited, 1997b).

The current law on environmental protection was adopted in 1995. The sections pertaining directly to the minerals industry are articles 14, 16, and 48. Article 14 describes the obligations that new and former owners have with respect to restoring environmental quality. Article 16 relates to the proscription of imports of raw or processed waste with the exception of those categories of waste that constitute a useful secondary resource of raw materials. Article 48 established procedures for monitoring the quality of soil and subsoil, which included plans for territorial development, exploratory drilling, geologic and hydrogeologic prospecting, and mining extraction activities.

As indicated above, Romania mined modest amounts of such nonferrous metal ores as bauxite, copper and lead, and zinc, as well as small quantities of iron ore.

By the start of 1997, the sole aluminum sector target of the denationalization by the State Ownership Fund (FPS) had been the Soc Com Alum SA alumina refinery in Tulcea. The 400,000-metric-ton-per-year (t/yr) alumina producer was purchased (51% interest) by Balli Group-UK and Bayraktar Holding of Turkey in early 1996. The bauxite feedstock for Alum was largely imported from Australia, Greece, Guinea, and India. About 40% of the alumina was exported. The plant's upgrade program included the addition of Alusuisse-Lonza (Switzerland) technology, which changed production from floury to sandy grade alumina (Standish, 1997c). This upgrade was necessary especially in view of Alro Slatina SA's requirements for sandy-grade material for the potlines. Alro's overall investment program called for increasing the plant's refined alumina production capacity to 600,000 metric tons (t) by 2003. The FPS would provide part of the finance for Alum's expansion, following a policy that would return 60% of the sale price to the owners of a given enterprise so long as the new owners settled the privatization debts and developed plans for modernization. The modernization effort, apart from facility expansion, also was to focus on reducing the plant's environmental impact (Standish, 1997b). Soc Com Alor SA in Oradea, Romania's other alumina refinery, remained entirely state owned in 1997; no plans were announced concerning changes to its ownership status.

Plans to fully denationalize Alro and Alprom SA, also of Slatina, the country's producer of rolled aluminum, were announced during the year. In 1997, Alro remained largely state owned, with the Government's share amounting to about 65% of total assets; 35% of the shares were distributed to the population through privatization vouchers. Similarly, the Government's share in Alprom amounted to 70%, with 12% held by institutional investors and 18% distributed to the population through privatization vouchers. The rolling mill had a rated production capacity of 67,000 t/yr, of which 45,000 t/yr represented rolled products; the balance covered extrusions and castings (Standish, 1997c).

Modernization programs at Alro included the upgrading of a potline with technical support from Pechiney of France. Modernization work on a second potline, also under contact with Pechiney, was begun in 1997. Additionally, the anode plant was upgraded during the year, and a new alumina feed system and modern dry scrubbers were installed. The latter raised dust entrainment from 68% to 98% (an increase of 44%) (Standish, 1997a).

Copper continued to be mined mostly in two districts—the northwestern part of the country with mines at Baia Mare, Baia Sprie, Cavnic, and Lesul Ursului and in the southwestern part of the country with major mines at Moldova Noua, Rosia Montana, and Rosia Poieni. Generally, the grade of ore has been low; major producing mines (Moldova Noua and Rosia Poieni) were hoisting ore grading only about 0.35% Cu or less. Concentrates from these areas have been smelted and refined at Baia Mare and Zlatna. At Baia Mare, Intreprinderea Metalurgica de Metale Neferoase (IMMN) operated an Outokumpu flash smelter, an electrolytic copper refinery, and a continuous caster. To process copper concentrates, IMMN operated an Outokumpu flash smelter and an electrolytic refinery at Zlatna (Serjeantson, 1995).

The work of the Romanian-Australian joint venture, Aurul SA, continued in 1997. Aurul comprised Aurul Esmeralda Ltd. of Australia and Romania's Regia Autonoma a Plumbului si Zincului (Lead and Zinc National Corporation) and Geomin SA. Aurul reported plans to put on line a US$28 million gold recovery plant at Baia Mare by the third quarter of 1998; the proposed facility would operate for about 7 years and would process about 15 million metric tons (Mt) of accumulated tailings in the region to produce 1.6 t/yr of gold and 6 t/yr of silver. The agreement called for the gold produced by the plant to be sold to the Romanian Central Bank at prevailing world prices. Aurul would receive payment in Romanian currency (Mining Journal, 1997a).

Gabriel Resources of Canada concluded a joint-venture agreement with the state-owned mining enterprise, Regia Autonoma a Cuprului Deva, to explore for and to mine gold in Transylvania's Golden Quadrilateral (comprising the cities of Baia de Aries, Brad, Sacarimb, and Zlatna) gold mining region. The initial distribution of stock in the joint venture was as follows: Gabriel Resources, 65%; Regia Deva, 33.8%; and others, 1.2%. The provisions in the agreement allow Gabriel to increase future holdings to 80% (Northern Miner, 1997). The area of interest to the joint venture comprises about 500 square kilometers and contains epithermal to mesothermal gold deposits associated with Badenian-Pliocene andecitic-dacitic volcanic and subvolcanic intrusions into breccia pipes, stockworks, and veins. Gold production in this region was reported to be about 140,000 ounces per year (Northern Miner, 1997). The Rosia Montana open pit and the Brad underground gold mines were the main assets in the region belonging to the joint venture. Gabriel has been doing feasibility studies connected with redeveloping the Rosia Montana Mine and reprocessing tailings from both mines. Rosia Montana's output has been reported tp be from 10,000 to 12,000 ounces per year.

At yearend, an independently prepared resource evaluation of Rosia Montana was prepared for Gabriel by the Resource Service Group of Australia (Mining Journal, 1997b). According to this study, inferred resources at the two largest deposits, Cetate and Carnic, were put at 45 Mt of ore grading 1.7 grams per metric ton of Ag and 2.46 million ounces of Au.

Gabriel also reported negotiations to establish a joint venture with Minexfor, Romania's state exploration agency, to explore for gold in the Bucium intrusive complex in the Metaliferi Mountains, about 85 kilometers (km) northeast of Deva (Northern Miner, 1997).

Romania continued to mine small quantities of iron ore; most feedstocks of ores and concentrates for the country's steel industry, however, had to be imported, mostly from the former Soviet Union. The major steel mills operated in Calarasi, Caras-Severin, Cluj, Galati, Hunedoara, Resita, and Targoviste.

The Government's program for the steel industry for 2002 called for total steelmaking capacity to be 1 Mt, which Government specialists considered to be necessary to meet domestic and export needs. Before the revolution of 1989, Romania's installed annual steelmaking capacity exceeded 16 Mt. The plan to modernize the steel industry involved more than 25 projects designed, in part, to improve the mix of products, to raise production efficiency, and to decrease material inputs during a 10-year period (Metal Bulletin, 1996).

In 1997, the output of crude steel increased by almost 10% compared with that of 1996. The major event in the industry involved the privatization process, which included foreign investment, as well as bids for shares of stock.

CSR S.A. Resita undertook a rationalization process that entailed the closure of the company's blast furnaces, coke ovens, and sinter plant, with future plans oriented to transforming steelmaking exclusively to electric arc furnace (EAF) operations. Open-hearth operations at Resita were limited entirely to the treatment of scrap. The installation of an 80-t EAF, a ladle furnace, and a vacuum degassing unit was undertaken by outside Spanish contractors. Spanish investors reportedly also were interested in the acquisition of stock in the company (Metal Bulletin, 1997). In June, Romania's FPS reported bids submitted by Italy's Finven SpA and Stainless Steel International SpA, Samsung Deutschland GmbH of Germany, and Usinor Sasilor of France to acquire shares in Otelinox S.A. Targoviste, a producer of stainless steel. The initial offering involved the sale of 51% of the company's stocks, amounting to 2.8 million shares at US$15 per share (Reuters Limited, 1997a).

Romania continued to produce low-grade lead and zinc ores grading from 0.4% lead and 0.6% zinc to 1.0% lead and 1.2% zinc at underground mines in the Baia Mare, Borsa, Certej, and Rodna districts; these lead and zinc ores also contained copper (0.35%), as well as associated antimony, bismuth, cadmium, gold, and silver. Owing to the complex mineralogy of the lead and zinc ores, concentrates produced from these ores proved to be uneven. Metal recovery in concentrate ranged between 50% and 75% for lead and zinc, respectively. Smelting and refining of lead and zinc from domestic and imported ores and concentrates were carried out at the Imperial Smelter at Copsa Mica, with capacities to produce about 42,000 t/yr of lead and 66,000 t/yr of zinc.

Romania produced a broad range of industrial minerals that included barite, bentonite, diatomite, feldspar, graphite, gypsum, kaolin, and limestone; these were produced at about 60 deposits throughout the country. The modernization Romania's economy and infrastructure has increased the demand for many of these commodities.

The trend to acquire cement plants in the Central European and Balkan region by European Union companies also extended to Romania in 1996-97. Major acquisitions included the purchases of the Romcim SA and Cimentul SA Turda cement plants by Lafarge of France and Holderbank Financiere Glaris Ltd. of Switzerland. Lafarge Romcim was established following the acquisition of 51% of Romcim shares of stock, valued at about US$200 million, by Lafarge. Romcim, the largest of Romania's six cement-producing enterprises, has supplied more than 41% of the domestic market. The enterprise comprised four cement plants in Asled, Hoghiz, Medgidia, and Tigru Jiu; the largest, the Medgidia plant, had a capacity of 2.5 million metric tons per year (Mt/yr) (Industrial Minerals, 1997c). Earlier in the year, Holderbank similarly acquired controlling interest in Cimentul, valued at a significantly lesser amount (US$11.5 million) than that in the Lafarge-Romcim transaction. Cimentul, about 30 km southeast of Cluj-Napoca in the northern part of the country, was

Romania's smallest cement-producing enterprise, accounting for less than 7% of domestic cement supply and comprised cement, gypsum, and lime operations (Industrial Minerals, 1997a). Annual production was about 800,000 t of portland cement and 100,000 t of white cement. At yearend, discussions among several West European cement producers and the Government of Romania about further acquisitions in this sector continued.

The Government of Romania placed the country's two phosphate fertilizer plants on the enterprise privatization list. At midyear, the Government offered 51% of the shares in the Fertilchim enterprise of Novodari and Romfoschim in Valea Calugareasca for sale. In addition to producing 70,000 t/yr and 50,000 t/yr, respectively, of phosphoric acid, the plants also produced sulfuric acid for the domestic market. Reportedly, the sale of the plants was to be handled by international investment banks rather than the FPS, which was undergoing reorganization (Fertilizer Week, 1997).

Romania produced coal, natural gas, and petroleum in sufficient quantities to meet domestic needs. Romania was among the world's oldest petroleum producers. The country reached its apogee of natural gas and petroleum output in 1976 when 14 Mt of petroleum and 1.33 trillion cubic feet of natural gas were produced. From 1976 to 1989, Romania's output of both commodities declined by more than 40%. The decline was the result of depletion and the need for modern oilfield technology. In 1997, total recoverable reserves of petroleum at deposits under exploitation in Romania amounted to 206 Mt, an amount that would be sufficient for about 30 years at a production rate of about 6.5 Mt/yr. Romania's oil refineries had the capacity to process more than 33 Mt/yr of petroleum.

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TABLE 1
ROMANIA: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity	1993	1994	1995	1996	1997
METALS					
Aluminum:					
Bauxite, gross weight	186,000	184,100	175,000	174,500 r/	127,450
Alumina, calcined, gross weight	293,000	301,576	322,774	260,637 r/	281,636
Ingot including alloys:					
Primary	116,000	119,600	140,500	140,874 r/	162,987
Secondary	3,700	2,814	3,446	3,678 r/	2,042
Total	119,700	122,414	143,946	144,552 r/	165,029
Bismuth, mine output, Bi content e/	40	40	40	40	40
Cadmium metal, smelter	10 e/	4	5	5	5
Copper:					
Mine output, Cu content	25,300	26,034	24,520	24,434 r/	23,190
Metal:					
Smelter:					
Primary	25,200 e/	23,499	23,355	32,622 r/	25,024
Secondary e/	1,000	1,000	1,000	1,000	1,000
Total	26,200	24,499	24,355	33,565	26,024
Refined:					
Primary	22,000 e/	22,113	22,013	24,305 r/	17,912
Secondary e/	3,000	4,600 3/	5,000	5,000	5,000
Total	25,000	26,713	27,013	29,305	22,912
Gold, mine output, Au content e/ kilograms	4,000	4,000 3/	4,000	4,000	3,500
Iron and steel:					
Iron ore:					
Gross weight thousand tons	855	951	565	500 r/	520
Metal content do.	130	198	147	140 r/	146
Metal:					
Pig iron do.	3,189	3,496	4,203	4,025	4,557
Ferroalloys:					
Ferrochromium	3,907	3,885	15,053	9,650	950
Ferrosilicon	23,600	28,385	19,320	23,827 r/	9,620
Ferromanganese	16,400	31,295	28,410	20,150	11,505
Ferrosilicomanganese	22,000 e/	35,215	57,149	78,590	62,570
Silicon metal e/	400	300	300	300	300
Steel, crude thousand tons	5,446	5,800	6,557	6,082	6,674
Semimanufactures:					
Pipes and tubes do.	414	472	546	591 r/	633
Rolled products do.	4,092	4,510	4,959	4,479 r/	4,804
Lead:					
Mine output, Pb content	16,929	23,838	23,194	21,356 r/	17,083
Smelter, primary e/	9,000 3/	12,000	12,000	12,000	10,000
Refined: e/					
Primary	11,800 3/	22,000	22,000	20,000	20,000
Secondary	5,610 3/	4,000	4,000	4,000	4,000
Total	17,410 3/	26,000	26,000	24,000	24,000
Manganese:					
Ore, gross weight thousand tons	125	137	130	150 e/	100 e/
Concentrate: 4/					
Gross weight do.	15	108	104	104	68
Mn content do.	4	28	27	26	17
Silver, mine output, Ag content	70	70	60	60 e/	60 e/
Zinc:					
Mine output, Zn content	28,017	35,357	34,730	32,082 r/	29,366
Metal, smelter, primary and secondary	14,100	18,500	29,300 r/	27,800 r/	25,000 e/
INDUSTRIAL MINERALS					
Barite, processed	12,050	29,274	18,169	12,541	12,729
Cement, hydraulic thousand tons	6,240	6,676	6,842	6,956 r/	7,298
Clays:					
Bentonite:					
Run of mine e/	120,000	100,000	100,000	100,000	60,000
Marketable	50,000 e/	41,056	42,277	43,543 r/	27,133

See footnotes at end of table.

TABLE 1--Continued

ROMANIA: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997
INDUSTRIAL MINERALS--Continued						
Clays--Continued:						
Kaolin:						
Run of mine e/		200,000	150,000	150,000	145,000	90,000
Marketable		60,000 e/	47,566	49,024	45,200	29,169
Diatomite		9,970	34,858	49,790	56,906 r/	23,880
Feldspar		87,700	31,123	30,920	34,975 r/	25,962
Fluorspar e/		15,000	15,000	15,000	15,000	15,000
Graphite		3,160	2,335	2,179	2,931	2,563
Gypsum	thousand tons	100 e/	124	111	91 r/	79
Lime	do.	1,738	1,621	1,763	1,748 r/	1,599
Nitrogen, N content of ammonia	do.	1,328	--	1,000	1,000 e/	1,000
Pyrites, gross weight	do.	560	350	250	250 e/	250 e/
Salt:						
Rock salt	do.	808	892	669	808 r/	254
Other	do.	1,380	1,310	1,820	1,881 r/	2,369
Total	do.	2,188	2,202	2,489	2,689	2,623
Sand and gravel	do.	4,400	831	901	907 r/	711
Sodium compounds, n.e.s.:						
Caustic soda	do.	330	298	383	326	322
Soda ash, manufactured, 100% Na_2CO_2 basis	do.	371	449	504	537 r/	548
Sulfur:						
S content of pyrites	do.	225	148	97	42 r/	52
Byproduct, all sources e/	do.	200	200	200	200	200
Total e/	do.	425	348	297	242 r/	252
Sulfuric acid	do.	527	491	477	422 r/	330
Talc		9,000	8,952	9,976	10,248	7,578
MINERAL FUELS AND RELATED MATERIALS						
Carbon black		27,400	19,325	21,555	26,023	21,400
Coal, washed:						
Anthracite and bituminous:						
For coke and semicoke production	thousand tons	465	444	349	312 r/	324
For other uses	do.	3,760	921	800 e/	10 r/	10
Brown	do.	573	--	--	1,000 r/	692
Lignite	do.	35,000	39,182	39,979	40,546 r/	32,281
Total	do.	39,798	40,547	41,128	41,868 r/	33,307
Coke:						
Metallurgical	do.	2,403	2,664	3,164	2,948 r/	3,110
Other	do.	198	--	220	1 r/	1
Total	do.	2,601	2,664	3,384	2,949 r/	3,111
Fuel briquets (from brown coal) e/	do.	70	71	--	-- 3/	--
Gas, natural, gross:						
Associated	million cubic meters	7,000 e/	1,499	1,410	1,361 r/	1,245
Nonassociated	do.	14,300 e/	18,099	17,606	16,801 r/	14,671
Total	do.	21,300 e/	19,598	19,016	18,162 r/	34,078
Petroleum:						
Crude:						
As reported	thousand tons	6,680	6,737	6,717	6,626 r/	6,515
Converted	thousand 42-gallon barrels	50,600	50,460	50,270	49,400	48,760
Refinery products e/	do.	95,000	115,200	145,000	132,000	125,000

e/ Estimated. r/ Revised.

1/ Includes data available through December 1998.

2/ In addition to the commodities listed, antimony, asbestos, and a variety of crude construction materials are produced, and molybdenum may have been produced as a byproduct of copper from 1988 on; output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

3/ Reported figure.

4/ Estimated series were based on published data on concentrate production.

TABLE 2
ROMANIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies (Government-owned unless otherwise specified)	Location of main facilities	Annual capacity
Alumina	Soc Com Alor SA	Plant at Oradea, near Hungarian border	250
Do.	Soc Com Alor SA (51%-owned by the Balli Group of the UNited Kingdom and the Bayrakter Co. of Turkey)	Plant at Tulcea, Danube Delta	400
Aluminum, primary	Alro SA (Slatina Aluminium Enterprise)	120 kilometers west of Bucharest	270
Barite	Ministry of Industry	Ortra Mine, Rosia Montana, southwest of Cluj	100
Bauxite	do.	Oradea-Dobresti Mining Complex, near Hungarian border	350
Cement	Cimentul SA Turda	Plant at Turda, 600 kilometers from port of Constanta	cement: 1,360 clinker: 850
Do.	Cimentul SA Cimus	Plant at Cimpulung, about 499 kilometers from port of Constanta	cement: 2,200 clinker: 1,360
Do.	Moldocim SA Bicaz	Plant at Bicaz, about 450 kilometers from port of Constanta	cement: 3,100 clinker: 1,520
Do.	Romcif SA Fieni	Plant at Fieni, about 420 kilometers from port of Constanta	cement: 1,600 clinker: 960
Do.	Romcim SA	Plant at Alesd, 812 kilometers from port of Constanta	cement: 3,500 clinker: 2,120
Do.	do.	Plant at Hoghiz, 437 kilometers from port of Constanta	cement: 2,200 clinker: 1,520
Do.	do.	Medgidia plant, about 35 kilometers west of Constanta	cement: 3,500 clinker: 1,980
Do.	do.	Plant at Jiu, about 5 33 kilometers from the port of Constanta	cement: 3,000 clinker: 2,045
Coal:			
Bituminous	Ministry of Industry	Valea Jiului Mining Complex, near Hunedoara	10,400
Lignite	Ministry of Industry, Oltenia Mining Complex, including Rovinari Mining Enterprise	Jiu Valley, Oltenia County, north of Craiova	20,300
Do.	Ploesti Mining Complex	About 50 kilometers north of Bucharest.	8,700
Copper:			
Ore (concentrate)	Ministry of Industry Department of Nonferrous Metals	Baia mare, Baia-Sprie, and Cavnic mines, northwestern area near the Ukrainian border; Rosia Montana, Noud, Borsa Balan, and Lesul-Ursului Mines--in east-west arc along Carpathian range; Rosia Poieni Mine; and Moldova Noua Mine, southwest near Danubian border with Yugoslavia	180
Metal	Intreprinderea Metalurgica de Metale Neferoase	Outokumpu flash smelter and electrolytic refinery at Baia Mare in the Northwestern area, near the Ukrainian border	35
Do.	do.	Zlatna smelter and refinery, Apuseni, northwest Romania	13
Ferroalloys	Ferom-Joint Stock Co.	Complex at Tulcea	280
Iron ore	Ministry of Industry	Mining complex at Hunedoara, in west-central Romania	1,320
Do.	do.	Resita Mining Complex, southwestern Romania, near Yugoslav border	660
Do.	do.	Napoca-Cluj Mining Complex, northwestern Romania on the Somesul River	990

TABLE 2--Continued
ROMANIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies (Government-owned unless otherwise specified)	Location of main facilities	Annual capacity
Lead in ore	Ministry of Industry	Baia Mare Mine, near Ukrainian and Hungarian borders	24
Do.	do.	Balan Mine, 50 kilometers southwest of Piatra Neamt	10
Lead metal	Metallurgical Enterprise for Nonferrous Metals	Imperial Smelter at Copsa Mica, central Romania, on the Tirnava Mare River	42
Natural gas million cubic feet per year	Ministry of Petroleum and Gas	Tirgu Mures Field at Tirgu Mures, north-central Romania	996,000
Do. do.	Ministry of Industry, Department of Energy	Ploesti Field, 50 kilometers north of Bucharest	249,000
Petroleum, crude barrels per day	do.	Ploesti-Teleajen, Pitesti, and Tirgoviste Fields, in Prahova Valley around Bucharest; Bacau Field at Bacau, east-central Romania near the Siretul River; and West Carpathian Field, southeastern Carpathian Mountains, between the west bank of the Olt River and Tirgu Jiu	250,000
Petroleum, refined do.	Ministry of Industry, Department of Energy	Refineries at Brazil, Pitesti, Onesti, Barcau, Borzesti, Brasov, Cimpina, Darmanesti, Oradea, Ploesti, Teleajen, and Navodari	664,000
Steel	EAsteel Siderurgica Romana SA Otel Rosu	Caras-Severin, southeastern region, near Yugoslav border	400
Do.	SC Industrie Sarmei SA	Campia Turzii, Cluj, northwestern Romania	300
Do.	Sidex S A Galati	Danube River, north of Brail, near the Ukrainian border	10,000
Do.	Siderurgica SA Hunedoara	West-central Romania, near Calan	2,135
Do.	CSR SA Resita	Southwestrn Romania, about 20 kilometers southwest of Caransebes	1,200
Do.	Siderica SA Calarasi	Near the Bulgarian border close to the Danube	2,200
Do.	COST SA Targoviste	Targoviste, Dimbovita, near Bucharest	1,100
Zinc in ore	Ministry of Industry, Baia Mare	Baia Mare, near Ukrainian and Hungarian borders	60
Zinc metal	Ministry of Industry, Metallurgical Enterprise for Nonferrous Metals	Imperial Smelter at Copsa Mica, Tirnava River, central Romania	66

THE MINERAL INDUSTRY OF

RUSSIA

By Richard M. Levine

Russia extends over more than 75% of the territory of the former Soviet Union (FSU) and accordingly possesses a high percentage of the FSU's mineral resources. Russia was a major mineral producer, accounting for a large percentage of the FSU's production of a range of mineral products, including aluminum, bauxite, cobalt, coal, diamonds, mica, natural gas, nickel, oil, platinum-group metals, tin, and a host of other metals, industrial minerals, and fuels. Still, Russia was significantly import dependent on a number of raw materials, including bauxite, chromite, manganese, titanium, and zirconium ores.

The most significant regions of the country for nonferrous metal mining are the Kola Peninsula (cobalt, copper, nickel, columbium (niobium), rare earth metals, and tantalum), the North Caucasus (copper, lead, molybdenum, tungsten, and zinc), East Siberia (cobalt, copper, lead, nickel, columbium (niobium), platinum-group metals, tungsten, and zinc), the Russian Far East (gold, lead, silver, tin, tungsten, and zinc), and the Urals (bauxite, cobalt, copper, lead, nickel, and zinc) (Novikov and Yastrzhembskiy, 1999). The country's major iron-ore-mining regions are the Kursk Magnetic Anomaly in Central Russia, the Kuznetsk basin in West Siberia, the Urals, and the Kola Peninsula in the far North West. The most significant region for oil and gas extraction is West Siberia, and coal deposits are dispersed mainly in northern and eastern regions of the country.

Russia possesses one of the world's largest mineral raw material bases. According to the assessment of experts from the Russian Federation Ministry of the Economy's Department of the Economics of Metallurgy, reserves are sufficient to supply existing enterprises mining iron ore for 15 to 20 years or longer and nonferrous metals for 10 to 30 years at the 1995-2000 levels of extraction. The picture was less favorable when viewed on a regional basis because it was predicted that in the near future a significant number of existing enterprises would be without adequate reserves (Novikov and Yastrzhembskiy, 1999). These experts stated that because mining enterprises were now working under market economy conditions, production and transport costs had greatly increased. Therefore, it was necessary to reevaluate the criteria for determining reserves. According to these experts, if this reevaluation were to happen, then actual reserves would diminish by 30% to 50% for ferrous and nonferrous metal reserves (Novikov and Yastrzhembskiy, 1999).

In 1997, Russia was extracting ore at 26 iron ore deposits, 160 nonferrous metals deposits, 1 chromite deposit, and numerous industrial minerals deposits (Novikov and Yastrzhembskiy, 1999). Russia remained one of the world's leading oil producers with 70% of its reserves concentrated in large deposits and was the leading country in the world in natural gas reserves; it has maintained gas production levels since the breakup of the Soviet Union despite a spate of economic difficulties. The country also reportedly possesses 140.2 billion metric tons of explored coal reserves, of which about 90% are located in the sparsely populated eastern part of the country (Kozlovskiy and Shchadov, 1999).

Lack of funding has caused a deterioration of capital stock at mining enterprises. At the majority of mining enterprises, there has been a sharp decrease in production indicators. As a result, during the last 7 years, more than 20 million metric tons of capacity has been decommissioned at iron-ore-mining enterprises. In the nonferrous sector in the past 7 years there has been a 9% loss in bauxite mining capacity and a 20% loss in copper mining capacity; there has been a loss in concentrate production capacity for lead of 39%, for molybdenum of 43%, for tin of 41%, for tungsten of 73%, and for zinc of 23% (Novikov and Yastrzhembskiy, 1999).

From 1995 to 1997, there was a slow growth in the price of ore concentrates while at the same time there was a sharp increase in the price of inputs for mining enterprises. As a consequence, the profitability of most enterprises sharply decreased in 1997. Additional explanations given for the unprofitability of mining enterprises included the low quality of the ore base, the sharp fall in demand for ferrous and rare metals, and new tax systems (Novikov and Yastrzhembskiy, 1999). Mineral consumption in Russia has fallen drastically since the dissolution of the Soviet Union because of the general downturn in economic activity and the sharp fall in defense industry production, which was a major consumer of a range of metals. Faced with the large downturn in domestic consumption, Russia has become a large exporter of minerals to world markets. It exported a large percentage of its production of nonferrous and precious metals and oil and gas. In cases where Russia was still exporting minerals to other FSU countries, it was, at times, incurring heavy debt from nonpayment, as was the case with natural gas shipments. Until economic activity in Russia increases significantly, Russia's mineral industries will continue to try to export a major share of their output to world markets.

The 1997 report on Russia's mineral industry is abbreviated. For more detailed coverage, please refer to the U.S. Geological Survey's 1996 Minerals Yearbook, Volume III, Mineral Industries of Europe and Central Eurasia.

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Novikov, A.A., and Yastrzhembskiy, I.E., 1999, Sovremennoye sostoyaniye i prognoz razvitiya promyshlennosti chernykh i tsvetnykh metallov Rossii: Gornyy Zhurnal (Mining Journal), no. 2, p. 13-16.

TABLE 1
RUSSIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1993	1994	1995	1996	1997 e/
METALS					
Aluminium:					
Ore and concentrate:					
Alumina	2,500,000 r/ e/	2,254,000 r/	2,300,000 r/ e/	2,105,000 r/	2,300,000
Bauxite, 26% to 57% alumina e/	4,260,000 2/	3,000,000	3,100,000	3,300,000	3,350,000
Nepheline concentrate, 25% to 30% e/	1,390,000 r/ 2/	1,300,000 r/	1,400,000 r/	1,300,000 r/	1,100,000
Metal, smelter, primary	2,820,000	2,670,496 r/	2,724,378 r/	2,874,236 r/	2,906,020 2
Antimony, mine output, Sb content	7,120 r/	7,000 r/	6,000 r/ e/	6,000 r/ e/	6,000
Arsenic, white e/	2,000	1,500	1,500	1,500	1,500
Beryllium, beryl, cobbed, 10% to 20% BeO e/	1,000	1,000	1,000	1,000	1,000
Bismuth, mine output, Bi content e/	60 r/	40 r/	50 r/	50 r/	50
Cadmium metal, smelter	700 e/	600	725	730	790
Chromium, chrome ore, marketable	120,800 r/	143,000 r/	151,400 r/	96,700 r/	150,000
Cobalt: e/					
Mine output, recoverable Co content	3,500	3,000	3,500	3,300 r/	3,300
Metal, refined	3,700	4,340	4,450	4,200	4,100
Copper:					
Ore, Cu content, recoverable	583,600	573,300	525,000 r/	520,000 r/ e/	505,000
Metal:					
Blister: e/					
Primary	534,000 r/	514,000 r/	525,000 r/	550,000 r/	575,000
Secondary	10,000	10,000	20,000	20,000 r/	25,000
Refined:					
Primary	486,000	452,000	504,000	513,000	550,000
Secondary	40,000	50,000	56,000	57,000	60,000
Total	1,070,000	1,026,000	1,105,000	1,140,000	1,210,000
Gold, mine output, Au content kilograms	149,500	146,600	132,170	123,000	115,000
Iron and steel:					
Iron ore, 55% to 63% Fe	76,100,000	73,300,000	75,900,000 r/	69,600,000 r/	70,800,000
Metal:					
Pig iron	40,871,000	36,116,000	39,762,000	36,061,000 r/	37,327,000
Direct-reduced iron	1,540,000	1,710,000	1,680,000	1,500,000	1,730,000
Ferroalloys: e/					
Blast furnace:					
Ferromanganese	150,000	55,000	55,000	55,000	55,000
Ferrophosphorus	25,000	20,000	20,000	20,000	20,000
Spiegeleisen	8,000	7,000	7,000	7,000	7,000
Electric furnace:					
Ferrochromium	255,900 2/	265,525 2/	290,000	135,000	247,000
Ferrochromiumsilicon	40,000	40,000	30,000	5,000	5,000
Ferronickel	47,000	59,000	77,000	75,000	40,000
Ferrosilicon	400,000	350,000	350,000	460,000	496,000 2/
Silicomanganese	--	--	700	--	--
Silicon metal	50,000	40,000	40,000	40,000	40,000
Other	50,000	40,000	40,000	40,000	40,000
Total	1,025,900	876,525	909,700	837,000	950,000
Steel:					
Crude	58,346,000	48,812,000	51,300,000	49,193,000	48,441,000 2
Finished	42,700,000	35,900,000	39,100,000	39,000,000 r/	37,800,000 2
Pipe	5,800,000	3,600,000	3,700,000	3,600,000 r/	3,500,000 2
Lead:					
Mine output, recoverable Pb content	34,000	25,000	23,000	18,000	19,500
Metal, smelter: e/					
Primary	34,000 r/	25,000 r/	20,000 r/	20,000 r/	32,000
Secondary	11,000 r/	9,000 r/	10,000 r/	10,000 r/	20,000
Total	45,000 r/	34,000	30,000	30,000 r/	52,000
Magnesium metal, including secondary	30,000 e/	35,400	37,500	35,000 e/	39,500
Mercury e/	60	50	50	50	50
Molybdenum e/	10,300	7,700	8,800	8,500 r/	8,500
Nickel: e/					
Mine output, recoverable Ni content	244,000 2/	240,000	251,000	230,000	260,000
Nickel products, including ferronickel	186,600 r/	180,900	201,100 r/	190,000	230,000

See footnotes at end of table.

TABLE 1--Continued
RUSSIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
METALS--Continued						
Platinum-group metals: e/						
Platinum		30,000 r/	22,500 r/	25,000 r/	25,000 r/	25,000
Palladium		95,000 r	70,000 r/	80,000 r/	80,000 r/	80,000
Other		4,000	3,000	3,500	3,500	3,500
Total		129,000	95,500	108,500	108,500	108,500
Silver e/		800,000 r/	800,000 r/	700,000	700,000 r/	700,000
Sulfur:						
Native		100,000	80,000	80,000	70,000	50,000
Pyrites		640,000	700,000	450,000	400,000	400,000
Byproduct, natural gas		2,680,000	2,550,000	2,970,000	3,000,000	2,950,000
Other		300,000	320,000	335,000	325,000	350,000
Total		3,720,000	3,650,000	3,835,000	3,795,000	3,750,000
Tin:						
Mine output, recoverable Sn content		13,100 r/	10,460 r/	9,000 r/ e/	8,000 r/ e/	7,500
Metal, smelter: e/						
Primary		13,400	11,500	9,500	9,000 r/	6,700
Secondary		1,000	1,000	1,000	1,000	1,000
Total		14,400	12,500	10,500	10,000 r/	7,700
Titanium sponge		10,000 e/	12,000 r/ e/	14,000	20,000	26,000
Tungsten concentrate, W content e/		8,000 r/	4,000 r/	5,400 r/	3,000 r/	3,000
Vanadium metal		12,800 r/	11,900 r/	11,000 r/	11,000 r/	11,000
Zinc:						
Mine output, recoverable Zn content		154,000	147,000	131,000	126,000	121,000
Metal, smelter: e/						
Primary		170,000 r/	110,000 r/	135,000 r/	140,000 r/	155,000
Secondary		33,000 r/	27,800 r/	31,000 r/	32,000 r/	30,000
Total		203,000	137,800	166,000	172,000	185,000
INDUSTRIAL MINERALS						
Asbestos, grades I-VI e/		1,000,000 r/	800,000 r/	800,000 r/	720,000 r/	700,000
Barite e/		70,000 r/	70,000	70,000	70,000	70,000
Cement, hydraulic		49,900,000	37,200,000	36,500,000 r/	27,800,000	26,600,000 2/
Clays: Kaolin including china clay		NA	NA	NA	NA	NA
Corundum, natural		NA	NA	NA	NA	NA
Diamond: e/						
Gem	carats	8,000,000	8,500,000	9,000,000	9,250,000	9,550,000
Industrial	do.	8,000,000	8,500,000	9,000,000	9,250,000	9,550,000
Synthetic	do.	80,000,000	80,000,000	80,000,000	80,000,000	80,000,000
Total	do.	96,000,000 r/	97,000,000 r/	98,000,000 r/	98,500,000 r/	99,100,000
Diatomite		70,000	50,000	50,000	50,000	50,000
Feldspar e/		70,000	55,000 r/	55,000 r/	45,000 r/	45,000
Fluorspar, concentrate 55% to 96.4% CaF_2		236,300 r/	250,000	250,000 e/	250,000 e/	250,000
Graphite e/		10,000	8,000	8,000	6,000 r/	6,000
Gypsum e/		1,500,000 r/	1,200,000 r/	1,200,000 r/	850,000 r/	800,000
Lime, dead-burned		NA	NA	NA	NA	NA
Lithium minerals, not further specified e/		3,000	2,000	2,000	2,000	2,000
Magnesite, marketable product e/		800,000	700,000	700,000	600,000 r/	600,000
Mica e/		129,000 2/	100,000	100,000	100,000	100,000
Nitrogen, N content of ammonia		8,138,000 r/	7,300,000 r/	7,900,000 r/	7,900,000 r/	7,150,000 2/
Phosphate rock: e/						
Apatite concentrate, 37% to 39.6% P_2O_5		9,000,000	7,700,000 r/	8,500,000	8,200,000 r/	7,200,000
Sedimentary rock, 19% to 30% P_2O_5		400,000	300,000	300,000	300,000	300,000
Total		9,400,000	8,000,000 r/	8,800,000	8,500,000 r/	7,500,000
Potash, marketable, K_2O equivalent		2,628,000	2,498,000	2,800,000	2,618,000 r/	3,400,000
Pyrite, gross weight		NA	NA	NA	NA	NA
Salt, all types e/		2,200,000	2,000,000	2,000,000 r/	1,600,000 r/	1,400,000
Sodium compounds, n.e.s., carbonate		1,992,000	1,585,000	1,823,000	1,500,000 r/	1,700,000 2/
Sulfur:						
Native		100,000	80,000	80,000	70,000	50,000
Pyrites		640,000 r/	700,000	450,000 r/	400,000 r/	400,000
Byproduct, natural gas		2,680,000 r/	2,550,000 r/	2,970,000 r/	3,000,000 r/	2,950,000
Other		300,000	320,000	335,000 r/	325,000	350,000

See footnotes at end of table.

TABLE 1--Continued
RUSSIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1993	1994	1995	1996	1997 e
INDUSTRIAL MINERALS--Continued					
Sulfur--Continued:					
Total	3,720,000 r/	3,650,000 r/	3,835,000 r/	3,795,000 r/	3,750,000
Sulfuric acid	8,243,000	6,334,000	6,946,000	5,650,000 r/ e/	6,100,000 2
Talc e/	131,688 2/	100,000	100,000	100,000	100,000
Vermiculite e/	50,000	40,000	40,000	30,000 r/	25,000
MINERAL FUELS AND RELATED MATERIALS					
Coal	306,000,000	272,000,000	262,000,000 r/	255,000,000	244,000,000 2
Coke, 6% moisture content	27,600,000	25,400,000	27,600,000	25,000,000 r/ e/	25,600,000 2
Gas, natural, marketed million cubic meters	618,000	607,000	595,000	601,000 r/	571,000 2
Oil shale	3,300,000	3,300,000	2,300,000 r/	2,000,000 e/	2,000,000
Peat, fuel use	2,500,000	2,900,000	2,900,000 r/	2,900,000 r/ e/	2,900,000
Petroleum:					
Crude:					
Gravimetric units	354,000,000	318,000,000	307,000,000	301,000,000	297,000,000 2
Converted, volumetric units e/ thousand 42-gallon barrels	2,600,000	2,300,000	2,250,000	2,200,000 r/ e/	2,180,000
Refinery products 3/	223,000,000	186,000,000	183,000,000	176,000,000	178,000,000 2
Uranium concentrate, U content	2,399 r/	2,968 r/	2,250 r/	2,000 r/	2,000 2

e/ Estimated. r/ Revised. NA Not available.

1/ Includes data available through April 29, 1999.

2/ Reported figure.

3/ Not distributed by type and, therefore, not suitable for conversion to volumetric units. Data include all energy and nonenergy products but exclude losses.

TABLE 2
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Metric tons unless otherwise specified)

Commodity	Major operating facilities 1/	Location	Annual capacity e/
Alumina refineries	Achinsk	Achinsk in East Siberia	900,000.
Do.	Bogoslovsk	Urals	1,050,000.
Do.	Boksitogorsk	European north	200,000.
Do.	Nadvoitsy	Nadvoitsy in Karelia	266,000.
Do.	Uralsk	Kamensk region	536,000.
Do.	Volkhov	Volkhov, east of St. Petersburg	45,000.
Aluminum, primary	Smelters:		
Do.	Volkhov	do.	20,000.
Do.	Uralsk	Kamensk	70,000.
Do.	Bogoslovsk	Krasnoturinsk	162,000.
Do.	Novokuznetsk	Novokuznetsk	284,000.
Do.	Kandalaksha	Kola Peninsula	62,500.
Do.	Nadvoitsy	Nadvoitsy in Karelia	68,000.
Do.	Volgograd	Volgograd	168,000.
Do.	Irkutsk	Sherekov, near Irkutsk	262,000.
Do.	Krasnoyarsk	Krasnoyarsk	755,000.
Do.	Bratsk	Bratsk	843,800.
Do.	Sayansk	Sayanogorsk	274,000.
Apatite, concentrate	Khibiny apatit association	Kola Peninsula	15,000,000.
Do.	Kovdor iron ore mining association	do.	700,000.
Asbestos	Kiyembay	Orenburg Oblast	500,000.
Do.	Tuvaasbest	Tuva Republic	250,000.
Do.	Uralasbest	Central Urals	1,100,000.
Bauxite	North-Urals mining company	Severouralsk region	NA.
Do.	South-Urals mining company	South Urals region	NA.
Do.	Severnaya Onega Mine	Northwest region	800,000.
Boron	Bor Association	Maritime region	140,000 (boric acid).
Do.	Amur River complex	Far East	8,000 (boric acid).
Do.	Alga River chemical complex	do.	12,000 (boric acid).
Chromite	Saranov complex	Saranov	200,000.
Coal	Basins:		
Do.	Donets (east)	Rostov Oblast	30,000,000.
Do.	Kansk Achinsk	East Siberia	50,000,000.
Do.	Kuznetsk	West Siberia	160,000,000.
Do.	Moscow	Moscow region	15,000,000.
Do.	Neryungri	Yakut-Sakha Republic	15,000,000.
Do.	Pechora	Komi Republic	30,000,000.
Do.	South Yakutia	Yakut-Sakha Republic	17,000,000.
Cobalt	Norilsk Nickel	Norilsk, Kola Peninsula	4,000.
Do.	Rezh, Ufaleynikel	Southern Urals	4,000
Do.	Yuzhuralnikel enterprises		(total southern Urals).
Do.	Tuva cobalt	Khovu-Aksy in Tuva Republic	NA.
Copper, mining and beneficiation complexes (Cu content of concentrates)	Buribai enterprise	Buribai region	5,000.
Do.	Gai complex	Gai region	40,000.
Do.	Kirovgrad complex	Kirovgrad region	12,000.
Do.	Krasnouralsk complex	Krasnouralsk region	12,000.
Do.	Norilsk complex	Norilsk region	400,000.
Do.	Sredneuralsk complex	Ekatrinenburg region	12,000.
Do.	Uchali complex	Uchali region	40,000.
Do.	Urap complex	Stavropol region	7,000.
Copper, metal (smelting and refining complexes)	Kirovgrad (smelting)	Kirovgrad	150,000
Do.	Krasnouralsk (smelting)	Krasnouralsk	60,000.
Do.	Kyshtym (refining)	Kyshtym	70000.
Do	Mednogorsk (smelting)	Mednogorsk	40,000.
Do.	Norilsk (smelting and refining)	Norilsk	500,000.
Do.	Pyshma (refining)	Pyshma	350,000.
Do.	Severonikel (smelting)	Monchegorsk	20,000.
Do.	Sredneuralsk (smelting)	Revda	140,000.

See footnotes at end of table.

TABLE 2--Continued
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Metric tons unless otherwise specified)

Commodity		Major operating facilities	Location	Annual capacity e/
Diamonds	thousand carats	Almazy Rossii-Sakha Association	Aykhal, Mirnyy, Udachnaya areas of Yakut-Sakha Republic	10,000 gem, 10,000 industrial
Feldspar		Deposits:		
Do.		Lupikko	Karelia	NA.
Do.		Kheto-Lanbino	do.	NA.
Ferroalloys		Kosaya Gora iron works	Kosaya Gora	200,000.
Do.		Kuznetsk ferroallloy plant	Novokuznetsk	400,000.
Do.		Lipetsk iron and steel works	Lipetsk	NA.
Do.		Serov ferroalloy plant	Serov	NA.
Do.		Tulachermet Scientific and Industrial Association	Tula	NA.
Do.		Chelyabinsk electrometallurgical plant	Chelyabinsk	350,000.
Do.		Chusovoy iron and steel plant	Chusovoy	NA.
Do.		Klyuchevsk ferroalloy plant	Dvurechinsk	160,000
Fluorspar		Mining and beneficiation complexes:		
Do.		Abagaytuy	trans-Baikal	NA.
Do.		Kalanguy	do.	NA.
Do.		Kyakhtinsky	do.	NA.
Do.		Usugli	do.	NA.
Do.		Yaroslavsky	Far East	NA.
Gold	kilograms	Gold mining regions:		200,000 (total gold).
Do.	do.	Yakut-Sakha	Yakut-Sakha Republic	
Do.	do.	Buryat	Buryat Republic	
Do.	do.	Magadan	Magadan Oblast	
Do.	do.	Krasnoyarsk	Krasnoyarsk region	
Do.	do.	Maritime	Maritime region	
Do.	do.	Tuva	Tuva Republic	
Iron ore		Mining areas:		
Do.		Kursk Magnetic Anomaly (KMA) containing following enterprises:		50,000,000 (total KMA)
Do.		Mikhailovka	Zheleznogorsk	
Do.		Lebedi	Gubkin	
Do.		Stoilo	do.	
Do.		Northwest containing following enterprises:		22,000,000 (total Northwest).
Do.		Olenegorsk	Olenogorsk	
Do.		Kostomuksha	Kostomuksha	
Do.		Kovdor	Kola Peninsula	
Do.		Siberia (east) containing the following mining enterprises:		18,000,000 (total Siberia east and west)
Do.		Korshunovo	Zheleznogorsk	
Do.		Rudnogorsk	Rudnogorsk	
Do.		Siberia (west) including the following mining enterprises:		
Do.		Abakan	Abaza	
Do.		Sheregesh	Sheregesh	
Do.		Tashtagol	Tashtagol	
Do.		Teya	Vershina Tei	
Do.		Urals containing following mining enterprises:		22,000,000 (total Urals).
Do.		Akkermanovka	Novotroitsk	
Do.		Bakal	Bakal	
Do.		Goroblagodat	Kushva	
Do.		Kachkanar	Kachkanar	
Do.		Magnitogorsk	Magnitogorsk	
Do.		Peshchanka	Rudnichny	
Lead-zinc (recoverable metal content of ore)		Mining complexes:		
Do.		Altay mining and beneficiation complex	Altay mountains region, South Siberia	2,000 lead, 1,000 zinc
Do.		Dalpolymetal mining and beneficiation complex	Maritime region	20,000 lead, 25,000 zinc
Do.		Nerchinsk polymetallic complex	Chita Oblast	7,000 lead, 12,500 zinc
Do.		Sadon lead-zinc complex	Severo-Ossetiya	5,000 lead, 14,000 zinc
Do.		Salair mining and beneficiation complex	Kemerovo Oblast	2,000 lead, 10,500 zinc

See footnotes at end of table.

TABLE 2--Continued
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Metric tons unless otherwise specified)

Commodity	Major operating facilities	Location	Annual capacity e/
Lead, metal	Dalpolymetal lead smelter	Rudnaya in the Maritime District	20,000.
Do.	Elektrozinc lead smelter	Vladikavkaz in North Caucasus	30,000.
Magnesite	Satka deposit	Chelyabinsk Oblast	3,800,000.
Magnesium, metal (for sale)	Avisma plant	Berezniki	22,000.
Do.	Solikamsk plant	Solikamsk	21,500.
Mica	Mining complexes:		
Do.	Aldan	Yakut-Sakha Republic	NA.
Do.	Karel	Karelia	NA.
Do.	Kovdor	Kola Peninsula	NA.
Do.	Mam	Irkutsk complex	NA.
Molybdenum, mining enteprise	Dzhida tungsten-molybdenum mine	West trans-Baikal	NA.
Do.	Sorsk molybdenum mining enterprise	Sorsk region	NA.
Do.	Tymy-Auz tungsten-molybdenum mining enterprise	North Caucasus	NA.
Do.	Shakhtaminskoye molybdenum mining enterprise	Chita Oblast	NA.
Natural gas billion cubic meters	Regions:		
Do. do.	Komi Republic	Komi Republic	8.0..
Do. do.	Norilsk area	Norilsk area	5.5..
Do. do.	North Caucasus	North Caucasus	6.0..
Do. do.	Sakhalin	Far East	2.0..
Do. do.	Tomsk Oblast	West Siberia	0.5..
Do. do.	Tyumen Oblast including:	do.	575.
Do. do.	Medvezhye field	do.	75..
Do. do.	Urengoi field	do.	300..
Do. do.	Vyngapur field	do.	17..
Do. do.	Yamburg field	do.	170..
Do. do.	Urals	Urals	45..
Do. do.	Volga	Volga region	6..
Do. do.	Yakut-Sakha	Yakut-Sakha Republic	1.5..
Nepheline syenite	Apatite complex	Kola Peninsula	1,500,000.
Do.	Kiya-Shaltyr Mine	Goryachegorsk region, East Siberia	NA.
Nickel, mining enterprise (Ni in ore)	Norilsk Nickel Association	Norilsk region and Kola Peninsula	300,000.
Do.	Yuzhuralnikel company	Southern Urals	20,000 total southern Urals).
Do	Ufaleynikel company	do.	
Nickel, metal (smelting and refining complexes)	Norilsk Nikel (smelting and refining)	Norilsk	160,000 (smelting), 100,000 (refining).
Do	do.	Pechenga	50,000 (smelting).
Do.	do.	Monchegorsk	50,000 (smelting), 140,000 (refining).
Do.	Rezh, Ufaleynikel, Yuzhuralnikel enterprises	Southern Urals	65,000 (total, nickel products and nickel in ferronickel).
Oil shale	Leningradslanets Association	Slantsy region	5,000.000.
Petroleum	Producing regions:		
Do.	European Russia:		
Do.	Astrakhan	Northern Caspian Sea Basin	700,000.
Do.	Bashkortostan	Urals	28,000,000.
Do.	Checheno-Ingush Republic	Southern Caucasus	4,500,000.
Do.	Dagestan	North Caucasus	700,000.
Do.	Kaliningrad Oblast	Baltic coast	1,800,000.
Do.	Komi Republic	Northwest	15,000,000.
Do.	Krasnodar Kray	North Caucasus	2,000,000.
Do.	Orenburg Oblast	Urals	13,000,000.
Do.	Perm Oblast	do.	12,000,000.
Do.	Samara	Volga region	16,000,000.
Do.	Saratov Oblast	do.	1,500,000.
Do.	Stavropol Kray	North Caucasus	2,000,000.
Do.	Tatarstan	Volga region	40,000,000.
Do.	Udmurt Republic	Urals	9,000,000.
Do.	East Siberia: Tomsk Oblast	Tomsk Oblast	11,000,000.

See footnotes at end of table.

TABLE 2--Continued
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Metric tons unless otherwise specified)

Commodity	Major operating facilities	Location	Annual capacity e/
Petroleum--Continued:			
Do.	West Siberia:		
Do.	Tyumen Oblast:	Tyumen Oblast	300,000,000
Do.	Kogolym field	do.	34,000,000
Do.	Krasnoleninskiy field	do.	12,000,000
Do.	Langepas field	do.	30,000,000
Do.	Megion field	do.	18,000,000
Do.	Nizhnevartovsk field	do.	70,000,000
Do.	Noyabrsk field	do.	37,000,000
Do.	Purneftegaz field	do.	12,000,000
Do.	Surgut field	do.	48,000,000
Do.	Uray field	do.	8,000,000
Do.	Varegan field	do.	10,000,000
Do.	Sakhalin Island	Sakhalin Island	2,500,000
Phosphate rock	Khibiny Apatit Association	Kola Peninsula	20,000,000 (apatite concentrate).
Do.	Kovdor iron ore mining complex	do.	700,000 (apatite concentrate).
Do.	Kingisepp complex	Leningrad Oblast	NA.
Do.	Lopatino, Yegorevsk deposits	Moscow Oblast	NA.
Do.	Polpinskoye deposit	Bryansk Oblast	NA.
Do	Verkhnekamsk deposit	Urals	NA.
Platinum-group metals:			130 (total metal)
Ore	Norilsk Nikel Association	Norilsk region	
Metals	Krasnoyarsk refinery of Norilsk Nikel Association	Krasnoyarsk	
Potash, K_2O	Uralkaliy	Verkhne Kamsk deposit	3,000,000
Do.	Silvinit	Solikamsk-Berezniki region of Urals	2,000,000
Silver	Dukat Mine	Magadan Oblast	1,000 (total silver)
Do.	Coproduct and byproduct of gold and nonferrous metals mining		
Soda ash	Achinsk plant	East Siberia	595
Do.	Berezniki plant	Urals	1,080
Do.	Pikalevo plant	Leningrad Oblast	200
Do	Sterlitamak plant	Sterlitamak	2,135
Do	Volkhov plant	Leningrad Oblast	20
Steel, crude	Amurstal	Komsomolsk na Amur	1,600,000
Do.	Asha	Asha	450,000
Do.	Beloretsk	Bashkir Republic	380,000
Do.	Chelyabinsk	Chelyabinsk	7,000,000
Do.	Cherepovets	Cherepovets	14,000,000
Do.	Chusovoy	Chusovoy	570,000
Do.	Elektrostal	Moscow	314,000
Do.	Gorky	Nizhniy-Novgorod	78,000
Do.	Guryevsk	Guryevsk	160,000
Do.	Karaganda	Karaganda	6,300,000
Do.	Kuznetsk	Novokuznetsk	4,700,000
Do.	Lipetsk	Lipetsk	9,900,000
Do.	Lysva	Lysva	350,000
Do.	Magnitogorsk	Magnitogorsk	16,200,000
Do.	Nizhniy Tagil	Nizhniy Tagil	8,000,000
Do.	Nizhniy Sergi	Nizhniy Sergi	300,000
Do.	Novosibirsk	Novosibirsk	1,100,000
Do.	Omutninsk	Omutninsk	210,000
Do.	Orsko-Khalilovo	Novotroitsk in Orenburg Oblast	4,600,000
Do.	Oskol Electric Steel	Stary Oskol	1,450,000
Do.	Petrovsk-Zabaikalskiy	Petrovsk-Zabaikalskiy	426,000
Do.	Revda	Revda	281,000
Do.	Salda	Sverdlovsk Oblast	1,900
Do.	Serov A.K.	Serov	1,000,000

See footnotes at end of table.

TABLE 2--Continued
RUSSIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Metric tons unless otherwise specified)

Commodity	Major operating facilities	Location	Annual capacity e/
Steel--Continued:			
Do.	Serp i Molot	Moscow	70,000.
Do.	Severskiy	Polevskoy in Sverdlovsk Oblast	825,000.
Do.	Sibelektrostal	Krasnoyarsk	110,000.
Do.	Sulin	Sulin	280,000.
Do.	Taganrog	Taganrog	925,000.
Do.	Tulachermet-Scientific and Industrial Association	Tula	18,400.
Do.	Verkh-Isetskiy	Ekatrinenburg	132,000.
Do.	Volgograd	Volgograd	2,000,000.
Do.	Vyksa	Vyksa	540,000.
Do.	West Siberian	Novokuznetsk	6,900,000.
Do.	Zlatoust	Zlatoust in Chelyabinsk Oblast	1,200,000.
Talc	Deposits:		
Do.	Onotsk	Irkutsk Oblast	NA.
Do.	Kirgiteysk	Krasnoyarsk Kray	NA.
Do.	Miass	Chelyabinsk Oblast	NA.
Do.	Shabrovsk	Sverdlovsk Oblast	NA.
Tin, mining and beneficiation complexes	Khingan	Khabarovsk Kray	NA.
Do.	Solnechnyy	do.	NA.
Do.	Iultin	Magadan Oblast	NA.
Do.	Khrustalnyy	Maritime region	NA.
Do.	Deputatskiy	Yakut-Sakha Republic	NA.
Do	Pevek	Magadan Oblast	NA.
Tin, smelters	Novosibirsk	Novosibirsk	NA.
Do.	Podolsk	Podolsk	NA.
Do.	Ryazan	Ryazan	NA.
Titanium, metal	Berezniki plant	Berezniki	40,000.
Do.	Moscow plant	Moscow	NA.
Do.	Podolsk plant	Podolsk	NA.
Tungsten, mining and beneficiation complexes (W content of concentrates)	Antonovogorsk	East Transbaikal	NA.
Do.	Balkan	Urals, northeast of Magnitogorsk	NA.
Do.	Belukha	East Trans-Baikal	NA,
Do.	Bom-Gorkhom	West Trans-Baikal	NA.
Do.	Dzhida	do.	NA.
Do.	Iultin	Magadan Oblast	NA.
Do	Lermontov	Maritime region	NA.
Do.	Solnechnyy	Southern Khabarovsk region	NA.
Do.	Tyrnyauz	North Caucasus	NA.
Do.	Primorye	Maritime region	NA.
Tungsten, metal	Nalchik plant	Caucasus	NA.
Uranium, U content	Priargunskiy mining and chemical enterprise	Krasnokamensk	3,000.
Vanadium, ore	Kachkanar iron ore mining complex	Urals	NA.
Vanadium, metallurgical processing facilities	Chusovoy plant	do.	17,000 (total metal).
Do.	Nizhniy Tagil plant	do.	
Zinc (nonassociated with lead), metal content of ore	Bashkir copper-zinc complex	Sibai in southern Urals	5,000.
Do.	Buribai copper-zinc mining complex	Buribai in southern Urals	1,500.
Do.	Gai copper-zinc mining and beneficiation complex	Gai in southern Urals	25,000.
Do.	Kirovgrad copper enterprise	Kirovgrad in central Urals	1,200.
Do.	Sredneuralsk copper complex	Revda in central Urals	5,000.
Do.	Uchali copper-zinc mining and beneficiation complex	Uchali in southern Urals	90,000.
Zinc, metal	Chelyabinsk electrolytic zinc plant	Chelyabinsk	190,000.
Do.	Elektrozink plant	Vladikavkaz in North Caucasus	100,000.

e/ Estimated. NA Not available.

1/ All mines unless otherwise specified.

TABLE 3
SELECT RUSSIAN EXPORTS

(Thousand metric tons)

Commodity		Quantity 1995	 1996	 1997
Aluminum, primary		2,249.9	2,619.4	2,706.3
To non-CIS countries		2,253.0	2,617.3	2,702.9
To CIS countries		4.2	2.2	3.4
Ammonia		3,257.0	3,263.9	3,240
To non-CIS countries		3,152.0	3,029.7	3,037
To CIS countries		105.0	234.2	203
Coal, hard		303,359.5	26,258.9	22,897.2
To non-CIS countries		21,242.9	20,866.1	19,537.7
To CIS countries		1.0	5,392.8	3,359.5
Coke		1,277.7	1,413.5	1,436.9
To non-CIS countries		212.5	521.5	575.4
To CIS countries		1,065.2	892.0	861.5
Copper, refined		471.2	529.6	534.5
To non-CIS countries		466.8	527.4	533.6
To CIS countries		4.4	2.2	0.9
Ferroalloys		496.9	285.5	342.6
To non-CIS countries		478.8	274.3	334.1
To CIS countries		18.1	11.2	8.5
Iron ore and concentrates		13,833.5	11,256.8	12,625
To non-CIS countries		11,369.8	7,890.8	NA
To CIS countries		2,513.7	3,366.0	NA
Natural gas	million cubic meters	192,193.0	198,514.0	200,858
To non-CIS countries		121,882.0	128,028.0	120,871
To CIS countries		70,311.0	70,486.0	79,987
Nickel		152.8	167.2	221.7
To non-CIS countries		152.5	166.9	221.5
To CIS countries		0.3	0.3	0.2
Petroleum, crude		122,336.1	125,952.8	126,846.8
To non-CIS countries		96,209.1	105,376.7	109,753.1
To CIS countries		26,127.0	20,576.1	17,093.7
Petroleum refinery products		47,075.2	57,006.1	60,592.6
To non-CIS countries		96,209.1	54,875.8	58,392.2
To CIS countries		3,528.3	1,605.8	2,200.4
Pig iron		2,888.2	2,109.4	2,455.1
To non-CIS countries		2,829.5	2,043.3	2,397.4
To CIS countries		58.7	66.1	57.7
Phosphate Rock		1,730	2,237	2,727
Potash, potassium chloride content		2,137.0	1,755.0	2,562
Titanium, rolled	metric tons	NA	18,660	32,370
Zinc, primary	do.	NA	117,490.0	118,750

NA Not avaliable.

THE MINERAL INDUSTRY OF

SERBIA AND MONTENEGRO

By Walter G. Steblez

In 1997, Serbia and Montenegro continued to have important European facilities to produce aluminum, copper, lead, silver, and zinc. The country also produced a broad range of industrial minerals, which included clays, feldspar, magnesite, mica, sand and gravel, and stone. Serbia and Montenegro continued to preserve the Federal union, claiming continuity as the Republic of Yugoslavia, a claim that has not been fully recognized. Before 1992, Serbia and Montenegro was the former Yugoslavia's chief producer of nonferrous metals and a leading producer of iron and steel, industrial minerals, and mineral fuels.

Although Serbia and Montenegro was not directly affected by the civil war in Bosnia and Herzegovina and other regions of the former Yugoslavia, the country's economy suffered a serious downturn between 1992 and 1995, owing to the trade embargo sanctioned by the United Nations. The embargo effectively stopped all Serbia and Montengro's foreign commercial activity, including the ability to borrow from foreign lending institutions. These circumstances also had negative consequences for the minerals industry. Many sectors showed significant declines of output during 1993 and 1994 and only began to show recovery in 1995 and 1996. *(See table 1.)*

In 1997, the economy of Serbia and Montenegro continued to show recovery and expansion following the cessation of economic sanctions by the United Nations at yearend 1995. In terms of physical production volume, total industrial production in 1997 increased by 10% compared with that of 1996. The production of energy increased by 8%. Total output by the metals sector increased by 25% compared with that of 1996. The production of iron and steel, nonferrous ores, and nonferrous metals rose by 45%, 10%, and 16%, respectively, and that of industrial mineral ores and industrial minerals, by 8% and 9% during this period (Federal Statistical Office of the Federal Republic of Yugoslavia, 1998b).

In 1997, Serbia and Montenegro's foreign commerce also registered recovery with the value of imports and exports rising by 34% and 48%, respectively. Germany, Russia, Italy, and the Republic of Macedonia were Serbia and Montenegro's major trading partners. The country's exports of fuels and lubricants and raw materials composed 7.4% of the total value of exports; imports of fuels and lubricant and raw material composed 24% of total imports (Federal Statistical Office of the Federal Republic of Yugoslavia, 1998a). A summary of minerals trade for 1997 is given in table 2.

Table 3 provides an overview of the most important enterprises, giving their names, locations of main facilities, and capacities. Major activities and issues in 1997 encompassed, among others, the aluminum, basalt, boron, iron and steel, and lead and zinc sectors.

Serbia and Montenegro's bauxite mining, alumina refining, and aluminum smelting facilities were located chiefly in Montenegro. According to spokespersons for DP Kombinat Aluminijuma Podgorica (Podgorica), the Podgorica alumina refinery and smelter was being prepared for privatization during the year (Metal Bulletin 1997a). International tenders of stock was under consideration by the Government as one way of privatizing the company. Modernization projects that have been under consideration at Podgorica included upgrading the anode plant, the foil-rolling and the rod mills, and the extrusion presses. To strengthen the company's competitiveness, the Government of Serbia and Montenegro set additional goals for the company that included the production of a wider range of value-added products, improvement of environmental protection measures, and the development of more-extensive commercial contacts with other European and Mediterranean countries (Metal Bulletin, 1997b).

Serbia and Montenegro was the former Yugoslavia's principal producer of copper. Rudarsko Tapionicki Bazen's (RTB) Bor mining, beneficiation, and smelting complex in Serbia accounted for all of Serbia and Montenegro's mine production of copper from its Bor, Majdanpek, and Veliki Krivelj open-pit mines. In 1997, total copper output continued to increase and approached 114,000 metric tons (t), the production level of 1992 (Federal Statistical Office of the Federal Republic of Yugoslavia, 1998b). In addition to domestic copper mining, smelting, and refining operations, RTB was able to reestablish some of the toll smelting and refining operations in 1996, which were interrupted during the trade embargo (Metal Bulletin, 1996).

The steel industry showed major recovery in 1996 and 1997. The production of pig iron and steel in 1996 increased by 496% and 376%, respectively, compared with that of 1995, and in 1997, output of pig iron and steel rose by 170% and 144%, respectively. The recovery in the steel sector was largely based on increased production at the Sartid AD—Smederevo steel works at Smederevo. The company planned to import 200,000 t of slabs for processing in 1997 in addition to domestically produced steel slabs. According to the Yugoslav Iron & Steel Federation, the slow rate of postsanctions industrial recovery had continued to depress domestic demand for steel, which resulted in more than 64% of the production in 1997 being exported (Metal Bulletin, 1997c, d).

The position of Serbia and Montenegro's lead and zinc industry generally appeared to be less favorable than that of the country's other producers of ferrous and nonferrous metals. Owing to production difficulties, Rudarsko Metalursko Hemijski Kombinat Olova I Cinka Trepca, Serbia and Montenegro's major mine and smelter producer of lead and zinc, was not able to meet its 1997 output target of 60,000 t for lead (Carnac, 1997). Compared with levels of 1996, the country's output of refined lead in 1997 declined by 22%, and that of refined zinc remained about constant.

Major activities in the industrial minerals sector in 1997 included the start of drilling at the Piskanja boron deposit in the Jaradnol Basin. The exploratory drilling program was started by Ras-Borati Ltd., a joint venture between Elektroprivredna, Serbia's national power company, and Erin Ventures Inc. of Canada. The company planned to complete a 15,000-meter drilling program, which was aimed at establishing an indicated reserve (35%-39% B_2O_3) of a 7-million-metric-ton (Mt) block as a proven reserve. The completion of the drilling program was expected by February 1998. Reportedly, Erin Ventures Ltd. agreed to allocate CAD$2.6 million to fund the drilling program. Preliminary studies indicated that the room-and-pillar method would be the most appropriate mining system. According to laboratory tests, marketable colemanite concentrates and sodium borates could be used to produce a 99.6% boric acid (Industrial Minerals, 1997b). Ras Borati also reported holding additional exploration rights in the Jaradno Basin at the Pobrdjski deposit where underground bulk samples and drilling outlined proven and probable reserves, grading an average 37% B_2O_3 and amounting to 140,000 t.

Basalt mining was planned to begin in 1997 at Mount Kopaonik in Vrelo. Reportedly, the Institute for Rare Ores in Kiev, Ukraine, expressed interest in a joint venture arrangement to develop the deposit. Reserves at the site were estimated to be 15 Mt (Industrial Minerals, 1997a). Serbia and Montenegro continued to produce coal, natural gas, and petroleum. Production of coal and natural gas showed gains in 1997, increasing by about 12% and 3%, respectively, compared with that of 1996. Petroleum output in 1997 declined by about 5%. The country's energy infrastructure included pipelines for crude petroleum that were 415 kilometers (km) in length, and those for refinery products and natural gas were 130 and 2,110 km, respectively.

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TABLE 1
SERBIA AND MONTENEGRO: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
METALS						
Aluminum:						
Bauxite, gross weight		102,000	--	60,000	323,000	470,000 4/
Alumina, calcined, gross weight		12,000	--	35,312	186,354	200,000
Metal, ingot, primary and secondary		25,778	6,850	16,991	37,436	65,743 4/
Antimony, metal		(3/)	(3/)	(3/)	(3/) e/	--
Bismuth, metal	kilograms	30	88	86	21	20
Cadmium	do.	6,301	3,000	11,079	79,195	80,000
Copper:						
Mine and concentrator output:						
Ore, gross weight	thousand tons	18,189	17,935	20,206	20,026	20,507
Cu content of ore		68,007	84,843	87,575	82,526	82,500 4/
Concentrate, gross weight		297,878	354,916	363,332	337,861	350,000
Metal:						
Blister and anodes:						
Primary		44,112	69,111	70,074	59,940	60,000
Remelted		13,286	17,440	17,336	65,287	60,000
Total		57,398	86,551	87,410	125,227	120,000
Refined:						
Primary		43,410	66,308	71,304	59,940	70,534
Remelted		7,890	5,841	7,147	44,060	43,000
Total		51,300	72,149	78,451	104,000	113,534 4/
Gold, refined	kilograms	3,330	2,504	3,040	3,000 e/	3,500
Iron and steel:						
Ore and concentrate, agglomerate		106,301	32,000	110,113	110,000 e/	110,000
Metal:						
Ferroalloys, ferronickel		1,283	1,763	2,414	6,501	6,500
Pig iron		62,490	16,763	107,836	535,000	907,000 4/
Crude steel		183,383	136,962	180,496	679,000	979,000 4/
Semimanufactures		174,000	174,000	242,000	860,000	1,460,000 4/
Lead:						
Mine and concentrate output:						
Ore, gross weight (Pb, Zn ore)		337,000	272,208	510,942	856,468	1,049,000 4/
Pb content of ore		9,229	6,651	11,689	22,327	27,000
Concentrate, gross weight		10,672	7,500	16,720	29,009	31,000
Pb content of concentrate		3,510	2,667	3,342	10,000 e/	11,000
Metal:						
Smelter, primary and secondary		8,593	12,274	19,231	44,600	32,000
Refined, primary and secondary		6,393	4,458	11,468	30,317	23,632 4/
Magnesium, metal		--	--	2,560	2,500 e/	2,500
Nickel, metal, Ni content of Fe Ni		443	663	962	2,556	2,500
Platinum-group metals:						
Palladium	kilograms	72	47	46	56	55
Platinum	do.	10	7	6	3	3
Selenium	do.	27,677	27,340	39,810	37,840	38,000
Silver	do.	25,144	18,298	31,054	68,805	42,640 4/
Zinc:						
Zn content of Pb, Zn ore		9,704	6,794	11,515	21,765	25,000
Concentrator output, gross weight		14,944	7,500	21,297	37,012	35,000
Zn content of concentrate		1,910	1,609	3,195	5,500 e/	5,000
Refined		6,985	3,895	5,976	29,954	29,454 4/
INDUSTRIAL MINERALS						
Asbestos fiber, all grades		314	498	497	450	250
Cement	thousand tons	1,088	1,612	1,696	2,205	2,011 4/

See footnotes at end of table.

TABLE 1--Continued
SERBIA AND MONTENEGRO: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
INDUSTRIAL MINERALS--Continued						
Clays:						
Bentonite		110	215	192	95	100
Ceramic clay		23,367	22,092	28,095	36,021	35,000
Fire clay:						
Crude		18,481	34,080	20,988	43,053	45,000
Calcined		4,825	5,376	4,091	8,000 e/	8,000
Kaolin:						
Crude		37,627	69,927	56,926	60,000 e/	60,000
Washed		4,800	7,110	4,900	6,000 e/	6,000
Feldspar, crude		2,679	3,256	5,441	4,801	5,000
Gypsum, crude		--	40,411	40,342	44,257	45,000
Lime	thousand tons	318	156	418 r/	456 r/	460 4/
Magnesite:						
Crude	do.	55	53	75 r/	89 r/	98 4/
Caustic calcined		7,812	5,896	4,078	1,061	1,100
Mica, all grades		68	158	199	200 e/	200
Nitrogren, N content of ammonia		99,900	158,518	135,401	235,070	250,000
Pumice and related volanic materials, volcanic tuff		74,230	154,188	117,664	120,135	120,000
Quartz sand	thousand tons	270	280	195	239	200
Salt, all sources		38,867	32,086	13,500	21,646	28,000 4/
Sand and gravel excluding glass sand	thousand cubic meters	1,669	1,814	2,070	3,291	2,351 4/
Sodium compounds:						
Caustic soda		4,086	4,748	7,252	20,214	64,713 4/
Sodium sulfate		3,668	2,870	7,178	7,000 e/	7,000
Stone, excluding quartz and quartzite, dimension, crude:						
Ornamental	square meters	212,581	213,000	237,000 r/	219,000 r/	206,000 4/
Crushed and broken, n.e.s.	thousand cubic meters	1,157	1,571	2,136	2,468	2,500
Other e/	cubic meters	5,000	5,000	5,000	5,000	5,000
Sulfur: e/						
Sulfur content of pyrite	thousand tons	1 4/	1	1	1	1
Byproduct:						
Metallurgy		110	110	110	110	100
Petroleum		1	1	1	1	1
Total		114	112	112	112	102
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Bituminous	thousand tons	73	82	57	63 r/	92 4/
Brown	do.	531	529	560	539	512 4/
Lignite	do.	36,829	37,740	39,939	37,828	42,313 4/
Total		37,433	38,351	40,556	38,430	42,917
Natural gas, gross production	million cubic meters	962	824	906	671	688 4/
Petroleum:						
Crude:						
As reported	thousand tons	1,148	1,078	1,066	1,030	979 4/
Converted	thousand 42-gallon ba	8,520	8,000	8,000	7,600	7,500
Refinery products e/	do.	15,000	13,800	13,000	12,500	12,000

e/ Estimated. r/ Revised.

1/ Table includes data available through June 1998.

2/ In addition to commodities listed, common clay and diatomite also are produced, and tellurium may be recovered as a copper refinery byproduct, but available information is inadequate to make reliable estimates of output levels.

3/ Less than 0.25 metric ton.

4/ Reported figure.

TABLE 2
SERBIA AND MONTENEGRO: EXPORTS AND IMPORTS OF SELECTED MINERAL COMMODITIES

(Metric tons)

Commodity	Exports 1996	Exports 1997	Imports 1996	Imports 1997
METALS				
Aluminum:				
Crude	34,634	55,451	--	--
Alloyed	4,505	7,974	--	--
Foil	--	--	2,044	2,164
Copper:				
Ore and concentrate	--	--	190,000	164,000
Blister	--	--	5,023	1,932
Anodes/cathodes	67,000	73,000	--	--
Wire, refined	10,342	13,390	--	--
Brass	6,863	6,698	--	--
Ferronickel	6,471	6,785	--	--
Iron and steel:				
Ore and concentrate	--	--	988,000	1,067,000
Semimanufactures	210,000	636,000	108,921	141,922
Lead:				
Ore and concentrate	--	--	28,213	36,607
Refined	25,140	17,605	--	--
Magnesiuim, unwrought	2,928	3,713	--	--
Silver, unwrought	58	35	--	--
Zinc, unalloyed	21,812	20,232	--	--
INDUSTRIAL MINERALS				
Cement, portland	99,000	40,000	--	--
Fertilizer	83,000	114,000	101,000	55,000
MINERAL FUELS				
Coke and semicoke	--	--	409,000	553,000
Petroleum:				
Crude	--	--	1,321,000	2,292,000
Refinery products:				
Kerosene	--	--	247,000	111,000
Gasoline	24,713	61905	--	--
Diesel fuels	25,918	35,518	--	--
Fuel oils	64,402	42,506	--	--

Source: Federal Statistical Office of the Federal Republic of Yugoslavia, 1998, INDEX--Monthly Review of Statistics: Federal Statatistical C
January, no. 1, p. 27-28.

TABLE 3
SERBIA AND MONTENEGRO: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand of metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Alumina		Kombinat Aluminijuma Titograd	Plant at Titograd, Montenegro	200.
Aluminum		do.	Smelter at Titograd, Montenegro	100.
Antimony, ores and concentrates		Zajaca, Rudarsko Tapionicarski Bazen	Mines and mills near Zajaca, Serbia	80.
Do.		do.	Mines and mill at Rajiceva Gora, Serbia	300.
Antimony, metal		do	Smelter at Zajaca, Serbia	4.
Bauxite		Rudnici Boksita, Niksic	Mines in Montenegro at Kutsko Brdo, Zagrad, Biocki Stan, Durakov Dol, and other locations	650.
Coal:				
Bituminous		Ibarski Rudnici Kamenog Uglja	Mines at Jarando and Usce, near Baljevac na Ibru, Serbia	250.
Lignite		SOUR Kolubara, Rudarsko Energetsko Industrijski Kombinat, RO	Opencast mines: Polje B and Polje D	10,000.
Do.		Kolubara Povrsinski Kopovi	Tamnavski Kopovi (also known as Kolubarski Rudnici Lignita), near Vreoci, Serbia	14,000.
Do.		SOUR Elektroprivreda Kosova, RO Kosovo, Proizvodnja Separacija i Transport Uglja	Opencast mines: Dobro Selo and Belacevac, near Obilic, Serbia	2,000.
Cement		Becinska Fabrika Cementa	Plant at Beocin, Serbia	2,031.
Do.		Fabrika Cementa Novi Popovac	Plant at Popovac, Serbia	1,613.
Copper		Rudarsko Topionicki Bazen Bor	Smelter at Bor, Serbia	180.
Do.		do.	Electrolytic refinery at Bor, Serbia	180
Do.		do.	Mine and mill at Bor, Serbia	5,000 ore
Do.		do.	Mine and mill at Majdanpek, Serbia	15,000 ore
Do.		do.	Mine and mill at Veliki Krivelj, Serbia	8,000 ore.
Lead-zinc ore		Rudarsko-Metalursko-Hemijski Kombinat za Olovo i Cink Trepca	Mines at Ajvalija, Kopanaonik, Badovac; Trepca, Blagodat, Lece; Veliki Majdan, Tisovak; and Kisnica, Rudnik, Suplja Stijena	5,000.
Do.		do.	Mills at Kriva Feja, Lece, Rudnik, Badovac, Leposavic, Zvecan, and Maravce, Suplja Stijena	3,160.
Do.		Hemijska Industrija Zorka: Brskovo, Rudnici Olova i Cinka	Mine at Brskovo, Montenegro	500.
Do.		Veliki Majdan Rudnik Olova i Cinka	Mine at mill near Krupanj, Serbia	250.
Lead, metal		Rudarsko Metalursko Hemijski Kombinat za Olovo i Cink Trepca	Smelter at Zvecan, Serbia	180.
Do.		do.	Refinery at Zvecan, Serbia	90.
Magnesite, concentrate		Rudnici Magnezita "Sumadija"	Mine and plant at Sumadija, 20 kilometers northwest of Cacak, Serbia	120.
Do.		Rudnik i Industrija Magnezita "Strezovce"	Opencast mine at Beli Kamen, Strezovce, near Itiova Metrovica, Serbia	300.
Do.		do.	Sinter plant at Strezovce	40.
Do.		Magnohrom, Rudnik Magnezita "Magnezit"	Mine at Bela Stena, Baljevac na Ibru, Serbia	30.
Natural gas	million cubic feet	Naftaplin (Naftagas), RO za Istrazivanje, i Prozvodnju Nafte i Gasa	Natural gas fields in Serbia Kinkinda and others	30,000
Petroleum:				
Crude	thousand barrels per day	Naftagas, Naftna Industrija	Oilfields in Serbia: Kikinda and others	30.
Refined	do.	Naftagas, Naftna Industrija:		
Do.	do.	Rafinerija Nafte Pancevo	Refinery at Pancevo, Serbia	110.
Do.	do.	Rafinerija Nafte Novi Sad	Refinery at Novi Sad, Serbia	28.
Pig iron		Metalurski Kombinat, Smederevo	Blast furance at Smederevo, Serbia	720.
Steel, crude		do.	Plant at Smederevo, Serbia	600.
Zinc metal		Rudarsko Metalursko Hemijski Kombinat Olova i Cinka Trepca, Metalurgija Cinka	Electrolytic plant at Titova Metrovica, Serbia	40.
Do.		Hemijska Industrija Zorka	Electrolytic plant at Sabac, Serbia	40.

THE MINERAL INDUSTRY OF

SLOVAKIA

By Walter G. Steblez

Slovakia continued to be a modest regional producer of a variety of minerals. (*See table 1.*) Aluminum and steel were the major components of the metals sector. Steel production was based largely on imported raw materials, and aluminum production was based entirely on imported bauxite and alumina. Slovakia also produced small quantities of copper, gold, lead, and zinc. Among industrial minerals, the country registered production of barite, clays, magnesite, and salt. Brown coal and lignite and small quantities of gas and petroleum comprised Slovakia's production of mineral fuels.

The Slovak Republic remained in transition to a market economy system. In 1997, private enterprise accounted for about two-thirds of the country's gross domestic product (GDP). In 1996, the growth rate of Slovakia's GDP amounted to about 7% but was expected to decline to 6.4% in 1997 and to about 5% in 1998 (Central Intelligence Agency, 1997).

Despite the country's robust economic growth during the past 3 years, a sharp increase in private and public sector consumption, coupled with a rapid increase in money supply, a decline in exports, and a rise in imports, has raised concerns about the reemergence of inflation. This and other factors appear to have hindered foreign investment in Slovakia's economy (Central Intelligence Agency, 1997). Noteworthy developments in 1997, as well as in the previous 3 years, included the growth of investment in the country's gold and industrial minerals mining sectors.

As in other former centrally planned economy countries of Europe, severe air pollution in Slovakia has been caused by the use of high-sulfur, low-grade coal and lignite to power the country's thermal electric power stations and by the country's chemical and metallurgical industries.

Despite the division of Czechoslovakia into separate countries in 1992, legislation to protect the environment, adopted since 1990, has remained operative. CSFR Law No. 309/91 on the Protection of the Atmosphere from Polluting Substances (9/91) codifies regulations concerning air pollution by defining sources of pollution, legal obligations of pollution-source operators, air-pollution control authorities, fees and penalties associated with atmospheric pollution, and setting pollution limits. Czechoslovak Law on Environment of 12/91 sets the basic definitions and principles regarding environmental protection, as well as the obligations of "legal and physical persons (bodies)" for protecting the environment during the use of natural resources.

To ensure effective control and management of severe regional environmental pollution, Slovakia and Poland signed a cooperative agreement on environmental protection in 1996. Both countries agreed to work toward eliminating threats to the environment that could have an impact beyond each country's border.

Despite the increasing orientation of the country's foreign commerce toward Western European market economy countries in recent years, Russia and other former member countries of the Council for Mutual Economic Assistance remained Slovakia's chief partners in mineral commodity trade. Russia remained Slovakia's principal supplier of natural gas and petroleum, and Hungary and Ukraine were major suppliers of bauxite and iron ore, respectively, to Slovakia's metal industries (World Trade Organization, 1996).

Zavod Slovenskeho Narodneho Postavnia (ZSNP) at Ziar nad Hronom was Czechoslovakia's sole producer of primary aluminum. Construction of the plant began in 1951 and production started in 1953. In 1985, ZSNP planned to modernize its aluminum smelting operations by replacing the technically dated and polluting Soderberg smelting process with state-of-the-art technology. ZNSP was remaned Slovalco in 1993, following restructuring of the enterprise's assets. Initially, Slovalco, wholly owned by ZSNP, began the construction of the new smelter and ancillary facilities. The technology that was chosen for the new plant was the Hydro Aluminium 230-kA system, which allowed for fully automated control of technological process with each reduction cell under the control of a microcomputer. Also, the new aluminum reduction plant and prebaked anode workshop would achieve significantly higher labor productivity and reduce emissions of waste into the atmosphere and power consumption. To complete this project, Slovalco signed a loan agreement with the European Bank for Reconstruction and Development (EBRD) worth US$110 million. The loan extended to Slovalco by EBRD established high aluminum production standards with respect to environmental protection. These standards were coordinate with the strictest environmental protection regulations in Western Europe (Light Metal Age, 1997). Also, EBRD and Hydro Aluminium a.s. of Norway each made equity investments of US$15 million in Slovalco. The company's investment profile as of August 1998 gave ZSNP 60% of the controlling equity; Hydro Aluminium and EBRD each had 20% (Light Metal Age, 1997).

Slovalco received more than 210,000 metric tons (t) of alumina from Hydro Aluminium, which had undertaken the responsibility of supplying alumina to Slovalco until 2000. After the alumina was purchased from Eurallumina (Sardinia), it was shipped to the port of Koper in Slovenia where it was temporarily bunkered in 20,000-t silos. About 18,000 to 20,000 t were transported 850 kilometers (km) each month from this facility to Slovalco by train. Slovalco's silo held a daily level of 9,000 to 11,000 t of alumina. Petcoke was supplied by Marathon Co. of Burghausen, Germany; liquid coal tar pitch was brought in from the Czech Republic. The new aluminum smelter received electric power from six

Siemens transformer-rectifier groups. The green anode plant (carbon) had the capacity to produce 85,000 metric tons per year (t/yr) of green anodes or 65,000 t/yr of rodded anodes. The plant was built by Fives Cail Babcock (FCB) of Givors, France, in 1988. The paste plant (fume scrubber) has a Procedaire pitch fume dry scrubber, installed by FCB, that uses coke as a scrubbing medium. Coke fines are included in the paste to make new anodes. The anode baking furnace is a natural gas-heated closed system consisting of 40 sections, giving a capacity of 70,000 t/yr. There are 6 pits per section with each pit containing 18 anodes in 3 layers arranged upside down. The system was supplied by Riedhammer of Nuremberg, Germany, and included the computer-controlled measuring and regulating system, firing equipment, combustion equipment for precipitator tar, etc. The smelter potline had a nominal capacity of 108,500 t/yr of liquid metal at a current efficiency of 93%. There were five alumina point feeders and one point feeder for aluminum flouride. Process-control equipment was supplied by Hydro Aluminium a.s. to monitor and control the electric reduction cells (Light Metal Age, 1997). The new technology at Slovalco has allowed a marked 96% reduction in the total emission of fluoride [from 9.71 kilograms per metric ton (kg/t) of Al to 0.37 kg/t].

According to Belmont Resources Inc. (1996), the state-owned mining enterprise, Rudne Bane, ceased operating the antimony-producing mine and mill in the Male Karpaty foothills in May 1992. The mineral rights of the mining and beneficiation complex (the so-called Pezinok concession) were transferred to Slovgold Slovakia s.r.o. in May 1996. In 1997, Slovgold conducted negotiations with Rudne Bane for the purchase of land, buildings, and equipment to conduct gold mining operations. Slovgold was a joint venture that was 51% owned by Belmont. The mine comprised an area of 720,000 square meters, and, owing to the long-term operation of this facility (early 1900's to 1992), infrastructure and availability of supplies, equipment, and skilled and semiskilled labor were adequate.

Exploration at the Rudne Bane antimony mine in the 1980's revealed a second vein that contained commercial gold values; the original exploited antimony-bearing vein, was nearly vertical and was about 3 km in length. Exploration was conducted underground. A total of 813 samples were collected to assay gold, as well as antimony, arsenic, and silver. The vein's depth was projected to 350 meters (m) below the surface. It was open along the strike length to the property boundaries. To date, proven reserves were established at 965,065 t of ore grading 3.76 grams per metric ton (g/t) of gold and 0.28% antimony (Belmont Resources Inc., 1996).

At Kremnica, Argosy Mining Corporation of Canada reported several discoveries during the company's gold exploration work in 1997. Drilling work in 1997 continued beyond the levels assigned for the 1996 exploration program at the South Ridge Zone (southwestern edge of the main Sturec Zone). All the drill cores (18 holes) showed potentially economic gold mineralization. The southern limit of the South Ridge Zone, however, remained untested during the year (Argosy Mining Corporation, 1998b). The new Wolf Zone, about 1,500 meters (m) north of the main Sturec Zone, also showed potentially economic gold mineralization within a width span of 150 to 200 m; the area along the strike (at least 600 m long), however, remained untested. Surface mapping in the vicinity of underground exploration and the presence of a stockwork zone above the known underground mineralization in the Vratislav Zone indicated the potential for additional discoveries. The Vratislav Zone is located between the Sturec and the Wolf Zones. The Volle Henne exploration target covers an area 200 m in width and 300 m in length. A soil survey at this working showed the system trending southward toward Katarina and northeast toward Vratislav. At the Katarina Zone, exploration work was concentrated in its southern area, which is 50 m in width and 150 m in length. Here, the vein system was narrow but high grade, hosting often visible gold. At the Katarina and the Volle Henne exploration zones, historical records of surface and underground mine workings, geochemical analysis of the soil, and outcrop sampling formed the basis of Argosy's analysis. The Horna Ves exploration target area had an identified structure of about 2.5 km lengthwise and open at both ends. Old open-pit workings and outcrops had suggested a width of 10 m, and anomolous gold value showings in Slovak Government trenching work indicated a possible width of more than 60 m. Argosy's geologic interpretation suggests the potential for significant mineralization that probably was bypassed by past mining operations. Metallurgical testing and analysis were done by Hazen Research, Inc., on five ore types in the Sturec "resource." Flotation and direct cyanidation methods were used, processes similar to those used at the Kremnica Mine.

Tests showed that the metallurgical processes at Kremnica would result in a 90% metal recovery by using cyanidation and 80% to 85% by means of flotation (Argosy Mining Corporation, 1998b). The calculation of resources was done independently by Western Services Engineering, Inc., in early 1998. The estimate for the Vratislav deposit at Kremnica was undertaken by the Slovak Geological Survey in 1992; however, this study had not been audited. To date, the total geologic resource at Kremnica was estimated at 1.1 million ounces of Au and 9.0 million ounces Ag. With a 0.5 g/t gold cut-off grade, the resource amounts to 22.3 Mt of ore grading 1.54 g/t gold and 12.5 g/t silver in the Sturec, the Vratislav, and the Wolf Zones. The Sturec Zone contains about 85% of the total gold in Kremnica.

In late November 1996, Argosy reported reaching an agreement with Hell Spolocnost s.r.o., owner of the Banska Stiavnica gold mining property, 30 km south of Kremnica, to undertake a program of exploration at the site. The agreement with respect to a 14.2-square-kilometer licensed site at Banska Stiavnica would give Argosy a 75% interest in a potential commercial operation. The Banska Stiavnica gold deposit is in Neogene volcanic rocks and consists of about "120 veins within the up-domed and block-faulted central section of a hydrothermally altered volcanic caldera" (Argosy Mining Corporation, 1998a). Most of the veins dip steeply to the east and range in thickness from 0.5 to 15 m. The entire vein system is 5 km long and 4 km wide. The upper, or surface parts of the veins were very rich, especially with respect to silver. This epithermal gold deposit was the largest producer of gold in Europe during the Middle Ages and, until the cessation of mining operations in 1993, had recorded a total production of 49,760 kilograms (kg) of gold and 5,162,200 kg of silver during its entire history of exploitation. Because little modern exploration had been done at Banska Stiavnica, Argosy planned an initial collection of data on geology and production at the site, which would be used in determining a subsequent drilling program. Recent exploration work at this site has indicated residual gold and silver resources remaining in previously unworked veins, vein margins, stope backfill, and pillars. Some mineral potential may exist at the new exploration targets of Ochsenkopf, south Terezia, central Terezia, Wolf-Spitaler, and Sobov, the first four of which were close to the new but unused Raven shaft completed in 1992. Drilling in 1997, however, showed the four targets to have been largely mined out in the tested areas (Argosy Mining Corporation, 1998a).

In Slovakia, iron ore has been mined from deposits at Nizna Slana, Roznava, and Rudnany. Currently, only siderite is mined at Nizna Slana; output has ranged from 800,000 to about 1,000,000 t/yr, and has graded from 27% to 30% Fe. The ore at Nizna Slana was barely economic, whereas the costs of mining operations at Roznava and Rudnany exceeded the selling price of the ore by 200%, requiring the termination of mining operations (Fabian, 1996). Because domestically produced iron ore could meet only a small portion of the needs of the country's steel industry, the major share of iron ore and concentrate was imported, mainly from Russia and Ukraine.

Slovakia was a significant producer of magnesite with output exceeding 800,000 t/yr. Other industrial minerals that were produced included barite, clays (bentonite and kaolin), limestone, perlite, and salt. The country also produced coal, natural gas, and petroleum. Slovakia's production of mineral fuels, however, was insufficient for domestic needs, requiring major imports, chiefly natural gas and petroleum, from the republics of the former Soviet Union.

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TABLE 1
SLOVAKIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997
METALS						
Aluminum:						
Alumina		140,000	75,000	100,000 e/	100,000	100,000
Aluminum ingot, primary		39,000 r/	33,000	38,139	121,825 r/	127,182 2/
Antimony, mine output, Sb content e/		450	--	--	--	--
Copper:						
Mine output:						
Ore, gross weight		310,000	--	--	190,000	185,000
Concentrate:						
Gross weight		2,000	--	--	1,600	1,300
Cu content e/		500	--	--	386 r/	314 2/
Metal:						
Smelter, primary e/		3,000	3,000	3,000	3,000	3,000
Refined, primary and secondary		23,000	20,000	29,000	25,000	25,000
Gallium metal	kilograms	1,300	600	600 e/	600	600
Gold metal	do.	100 e/	372	518	540	457 2/
Iron and steel:						
Iron ore:						
Gross weight	thousand tons	920	870 r/	820	850	850
Fe content	do.	250	230	225 e/	240	250
Concentrate, Fe content	do.	450 e/	450 e/	446	436	453 2/
Metal:						
Pig iron	do.	3,205	3,330	3,207 r/	3,300	3,300
Ferroalloys, total electric furnace 3/	do.	115	124	140 e/	93 r/	95
Ferrochromium		50,600	48,555	65,260	19,900	11,394 2/
Ferrosilicon		22,000	30,000	30,000	30,000	30,000
Steel, crude	thousand tons	3,768	3,948	3,921	3,600	3,800 2/
Semimanufactures	do.	3,457	3,662	3,686	3,500	3,600
Lead, mine output: e/						
Concentrate, gross weight		3,500	3,500	3,500	3,500	3,500
Pb content		1,800	1,800	1,800	1,000 r/	1,000
Mercury		50	--	--	--	--
Tin-tungsten ore, gross weight	thousand tons	190	190	--	--	--
Zinc:						
Mine output:						
Ore, gross weight		300,000	290,000	300,000 r/	300,000	300,000
Concentrate: e/						
Gross weight		6,500	6,500	6,500	6,500	6,500
Zn content		2,900	2,800	2,800	2,800	2,800
Metal, secondary e/		1,000	1,000	1,000	1,000	1,000
INDUSTRIAL MINERALS						
Barite		31,300 r/	45,700 r/	41,600 r/	44,930 r/	62,102 2/
Cement, hydraulic e/	thousand tons	2,500	2,500	2,500	2,500	2,500
Clays:						
Bentonite		50,000 e/	60,310	74,960	74,820	79,760 2/
Kaolin		25,000	24,100	13,300 r/	23,240	22,720 2/
Diamond, synthetic e/	carats	5,000	5,000	5,000	5,000	5,000
Dolomite	thousand tons	2,500	1,700	1,800 e/	1,800	2,000
Fertilizer, manufactured: e/						
Nitrogenous, N content		170,000	170,000	170,000	170,000	170,000
Phosphatic, P2O5 content		120,000	120,000	120,000	120,000	120,000
Potassic, K2O content		10,000	10,000	10,000	10,000	10,000
Mixed		50,000	50,000	50,000	50,000	50,000
Gypsum and anhydrite, crude		75,000	122,000	131,000	110,000	100,000
Lime, hydrated and quicklime e/	thousand tons	1,070 2/	1,000	1,000	1,000	1,000
Magnesite, crude		1,200,000	616,900	814,500	824,800 r/	863,600 2/
Nitrogen, N content of ammonia e/		263,000 2/	250,000	250,000	250,000	250,000
Perlite		50,000	28,270	21,850	25,160	25,000
Salt		70,000 e/	99,600	99,750	106,800	100,500 2/

See footnotes at end of table.

TABLE 1--Continued
SLOVAKIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
INDUSTRIAL MINERALS--Continued						
Stone:						
Limestone and other calcareous stones	thousand tons	4,500	3,887	4,000 e/	4,000 e/	4,000
Quarry stone, not further described e/	thousand cubic meters	5,000	5,000	5,000	5,000	5,000
Talc		5,000 e/	4,800	5,000 e/	5,000 e/	5,000
Zeolite		25,000	12,670	9,720	6,900 e/	5,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, brown and lignite	thousand tons	3,500	4,078	4,140	3,829	3,942 2/
Coke: e/						
Metallurgical	do.	1,880 2/	1,900	1,900	1,900	1,900
Unspecified	do.	300	200	200	200	200
Gas, manufactured, coke oven	million cubic meters	900 e/	291	345	307	286 2/
Petroleum:						
Crude:						
As reported	thousand tons	70	68	74	71	63 2/
Converted	thousand 42-gallon barrels	475	460	500	480	426
Refinery products e/	do.	40,500	40,500	40,500	40,500	40,000

e/ Estimated. r/ Revised.

1/ Table includes data available through December 1998. In addition to the commodities listed, arsenic, diatomite, feldspar, illite, sodium compounds, sulfur, sulfuric acid, and talc are produced, but information is inadequate to make reliable estimates of output.

2/ Reported figure.

3/ May include some FeCrSi and FeNi, if any was produced.

TABLE 2
SLOVAKIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousands of metric tons unless otherwise specified)

Commodity		Major operating companies 1/	Location of main facilities 2/	Annual capacity
Aluminum		ZSNP Aluminum Works	Ziar nad Hronom, central Slovakia	108
Antimony, ore		Liptovska Dubrava	Central Slovakia	50
Do.		Pezinok	West Slovakia	50
Smelter		Vajskova	Central Slovakia	2
Cement		Lietavska Lucka, Stupava, and Turna	Slovakia	5,400
Coal, brown		ULB administration	Prievidza, central Slovakia	6,800
Copper:				
Ore		Slovinky, Hodrusa-Hamre, and Rudnany	Central Slovakia	500
Refinery		Krompachy	do.	27
Gallium	kilograms	SNP Aluminum Works	Ziar nad Hronom, central Slovakia	4,000
Iron:				
Ore		Nizana Slana	Central Slovakia	1,000
Concentrate		do.	do.	1,300
Lead-zinc, ore		Banska Stiavnica	do.	200
Magnesite		SMZ administration	East Slovakia	550
Mercury	metric tons	Dubnik, Malachov, and Rudnany	Central Slovakia	150
Petroleum, refinery		Bratislava, Strazske, and Zvolen	Slovakia	NA
Steel, crude		Vychodoslvenske Zeleziarne sp (East Slovak Iron and Steel Works)	Slovakia, Kosice	4,000
Do.		Svermove zeleziarne	Slovakia, Podbrezova	600

NA Not available.

1/ All mining companies are Government owned.

2/ Names and locations of mines and crude oil refineries are identical.

THE MINERAL INDUSTRY OF

SLOVENIA

By Walter G. Steblez

In 1997, Slovenia remained a modest producer of such mineral commodities as aluminum, ferroalloys, and steel and of fossil fuels, which included coal, natural gas, and petroleum. Within the framework of the minerals industry of the former Yugoslavia, Slovenia had been an important producer of lead, mercury, uranium, and zinc. The mine production of these commodities, however, had either ceased or was in the process of closure. Among the republics of the former Yugoslavia, Slovenia had the most modern fabricating industry and a per capita income equal to about twice the average for the republics. Given that industry and infrastructure were not severely affected by the conflict in the former Yugoslavia, Slovenia was able to adapt more easily to Western European economic practices than most of the other Republics.

Following disassociation with Yugoslavia in 1991, the Government of Slovenia developed policies aimed at limiting economic dislocations in terms of employment, industrial production, and foreign commerce. These policies also were designed to limit the rate of inflation and to bring the country's economy in line with Western European market practices. Enterprises in the minerals sector no longer must produce at all costs as many of them had been required to do under central economic planning.

In 1997, Slovenia's gross domestic product (GDP) rose by about 3.8% compared with that of 1995 (Slovenian Economic Mirror, 1998). Industrial production during this period increased by 1.1%, with the value of output of the mining and extracting sector rising slightly (0.4%) compared with that of 1995.

Major concerns about Slovenia's environment resulted in the inclusion of provisions for environmental protection in the country's new constitution. The Environmental Protection Law presented the Government's general policies for protecting the environment and specified regulations for the commercial use of natural resources, the establishment of an inspection directorate, and of provisions for monitoring, environmental impact assessments, and research (Ilesic, 1994). The Ministry of Environmental Protection and Physical Planning was established to undertake this work. Major sources of pollution included the use of lignite and brown coal, nonferrous metals processing, and the petrochemical sector.

Aluminum and steel were the major mineral commodities produced in Slovenia. Alumina and aluminum were produced at the refinery and smelter operated by Talum d.o.o. (formerly, Unial, Tvornica Glinice I Aluminija Boris Kidric in Kidricevo). In 1996, following a cooperative agreement with Hydro Aluminium A.S. of Norway, a new aluminum extrusion plant facility was added to Talum d.o.o.'s casthouse. The new extrusion facility would consume about 35,000 metric tons per year (t/yr) of aluminum ingot, or more than one-half of the total aluminium production of Slovenia. Lacking domestic sources of bauxite, Slovenia had to depend entirely on imports of bauxite for its alumina-refining and aluminum-smelting operations.

Slovenia's steel industry comprised three steel mills operated by Zdruzeno Podjetje Slovenske Zeljezare at Jesenice, Ravna na Kuroskem, and Store. In recent years, all production of crude steel was from electric furnaces. Beginning in 1995, Slovenia's production of crude steel has rebounded with production exceeding 400,000 t/yr. During Slovenia's adjustment to new commercial circumstances, output in 1991-92 fell to below 300,000 t/yr. Ferroalloys were produced at the Tovarna Dusika Ruse plant. Most of the ferrochromium produced there was sold directly to the country's stainless steel producer at Jesenice. Owing to high electric power costs and the unfavorable import prices for chromite in 1997, the management of Tovarna Dusika Ruse reported plans to suspend the production of high-carbon ferrochromium from yearend 1996 until March 1997 (Metal Bulletin, 1996). The company planned to produce lesser quantities of low-carbon ferrochromium during this same period. All the plant's output of ferrosilicon is consumed by the domestic steel industry.

Slovenia produced small quantities of clays, gypsum, ornamental stone, and other industrial minerals mostly for domestic use. Glass sand was a important industrial mineral that was consumed by the glass industry with an annual output of more than 25,000 t/yr.

The country was the only republic in former Yugoslavia to have produced all forms of commercial energy—coal, lignite, natural gas, petroleum, and uranium, which had been discontinued in 1991. Slovenia generated electricity with nuclear and hydroelectric power stations. The nuclear powerplant at Krsko, which has an installed electric-power-generating capacity of 632 megawatts, and which has been jointly owned with Croatia, was expected to continue operation until 2010. Slovenia's infrastructure included 305 kilometers (km) of natural gas pipelines and 290 km of petroleum pipelines.

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TABLE 1
SLOVENIA: APPARENT PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity	1993	1994	1995	1996	1997e/
METALS					
Aluminum:					
Alumina	2,000	3,000	14,000 r/	15,000 r/	15,000
Metal, ingot, primary and secondary	82,682	76,741	57,692 r/	60,000 r/	60,000
Iron and steel, Metal:					
Ferroalloys:					
Ferrochromium	8,812 r/	13,412 r/	23,247 r/	22,819 r/	9,232 3/
Ferrosilicocalcium	200	200	200	200	200
Ferrosilicon	12,000	12,000	12,000	10,000	10,000
Crude steel from electric furnaces	355,000	424,000	450,000	407,000 r/	400,000
Semimanufactures	126,596	189,071	175,000	175,000	175,000
Lead:					
Mine output:					
Ore, gross weight (Pb-Zn ore)	62,000	25,000	-- r/	-- r/	--
Pb content of ores e/	820 r/	350 r/	-- r/	-- r/	--
Metal:					
Smelter, primary and secondary e/	7,000	8,000	8,000	8,000	8,000
Refined, primary and secondary	6,424	7,425	7,237 r/	7,000	7,000
Pb semimanufactures, rolled	202	252	271	300	300
Mercury kilograms	--	6,000	5,000 r/	5,000 r/	5,000
Silver do.	--	--	--	--	--
Zinc:					
Zinc content of PbZn ore	600 r/	300 r/	--	--	--
Concentrate output, gross weight	--	--	--	--	--
Zn , metal e/	2,500	2,500	2,500	2,000	--
Zn semimanufactures, rolled	9,386	10,773	11,851	12,000	12,000
INDUSTRIAL MINERALS					
Cement thousand tons	707	898	991 r/	900	900
Clays:					
Ceramic clay, crude	2,500	2,500	2,500	2,500	2,500
Fire clay, crude	857	589	-- r/	600	--
Kaolin:					
Crude	10,000	10,000	10,000	10,000	10,000
Washed e/	4,000	4,000	4,000	4,000	4,000
Gypsum, crude e/	10,000	10,000	10,000	10,000	10,000
Lime thousand tons	135	160	149 r/	150	150
Pumice and related materials, volcanic tuff e/	40,000	40,000	40,000	40,000	40,000
Quartz, quartzite, glass sand:					
Quartz and quartzite	10,000	10,000	10,000	10,000	10,000
Glass sand	200,000	200,000	200,000	200,000	200,000
Total	210,000	210,000	210,000	210,000	210,000
Salt, all sources	12,300	11,230	2,738 r/	5,000 r/	5,000
Sand and gravel, excluding glass sand thousand cubic meters	2,000	2,000	2,000	2,000	2,000
Stone, excluding quartz and quartzite, dimension, crude: e/					
Ornamental cubic meters	324,000	254,000	237,000 r/	300,000	300,000
Other do.	3,000	3,000	3,000	3,000	3,000
Crushed and brown, n.e.s. thousand cubic meters	1,000	1,000	1,000	1,000	1,000
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Brown coal thousand tons	1,200	1,079	967 r/	1,100 e/	1,000
Lignite do.	3,921	3,775	3,917 r/	4,000 e/	4,000
Natural gas, gross producing thousand cubic meters	13,392	12,595	18,220 r/	13,000 r/ e/	15,000
Petroleum:					
Crude:					
As reported thousand tons	1,925	1,716	1,858 r/	1,900	1,900
Converted thousand 42-gallon barrels	14,000	13,000	14,000	14,000	14,000
Refinery products e/ do.	3,500	3,500	3,500	3,500	3,500

e/ Estimated. r/ Revised.

1/Table includes data available through May 1998.

2/In addition to commodities listed, common clay also was produced, but available information is inadequate to make reliable estimates of output levels.

3/ Reported figure.

TABLE 2
SLOVENIA: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Alumina	Talum d.o.o.	Plant at Kidricevo	120
Aluminum	do.	Smelter at Kidricevo	72
Coal:			
Brown	SOZC, Rudarsko Energetski Kombinat E. Kardelj, Trobovlje, Slovenia	Mines: Sasavski Rudnici at Trbovlje, Hrastnik, Ojstro, Senovo, and Kanizarnica	1,300
Lignite	Rudarsko Energetski Kombinat Velenje, RO Rudnik Lignita-Velenje	Mine at Velenje	5,000
Cement	Salonit Anhovo	Plant at Anhovo	1,120
Lead metal	Rudnik Svinca in Topilnica, Mezica	Smelter at Mezica	35
Do.	do.	Refinery at Mezica	30
Mercury	Rudnik Zivega Srebra, Idrija	Mine and smelter in Idrija	15,000 1/
Petroleum, refined	Industrija Nafte (INA) Rafinerija Nafte Lendava	Refinery at Lendava	16 2/
Pig iron	Zdruzeno Podjetje Slovenske Zelezarne	Two blast furaces at Zelazara Jesenice	300
Do.	Zelezara Store	Electric reduction furnaces at Store pri Celju	290
Steel, crude	Zdruzeno Podjetje Slovenske Zelezarne	Plant at Jesenica	500
Do.	do.	Plant at Ravne	162
Do.	do.	Plant at Store	140

1/ Flasks per year.

2/ Thousand barrels per day.

THE MINERAL INDUSTRY OF

SPAIN

By Harold R. Newman

Spain, which has some of the most mineralized territory in Western Europe, was a significant European producer of nonferrous and precious metals. The main polymetallic deposits, from west to east, included Tharsis, Scotiel, Rio Tinto, and Aznalcollar. In terms of value of metallic and nonmetallic minerals and quarry products, Spain was a leader among the European Union (EU) countries. Consequently, Spain had one of the highest levels of self-sufficiency with respect to mineral raw materials among the EU members. Of the approximately 100 mineral products mined, only about 18 were produced in significant quantities—bentonite, copper, fluorspar, glauberite, iron, lead, magnetite, mercury, potassic and sepiolitic salts, pyrites, quartz, refractory argillite, sea and rock salt, tin, tungsten, and zinc.

Production of many metallic minerals in Spain was insufficient to meet domestic demand, so these must be imported. For most nonmetallic minerals, however, production far exceeded domestic consumption, and thus surpluses were exported. The economic development of certain regions, such as the Basque country and Asturias, was based on their mineral wealth, and mining continued to be an important current and potential source of income in these and other areas.

Privatization of the Spanish mining industry continued and was the subject of protest at a number of mining operations throughout the country because of employment issues.

With a few exceptions, the year was marked by a decline in output of mineral products. (*See table 1.*) Of the major metals, the only commodity with a significant increase in metal production was copper. Mine production of copper continued at about the same level as that of 1996. Production of gold, iron ore, lead, silver, and zinc decreased; total refined copper production increased; and lead metal output dropped slightly. Mine production of zinc rose slightly. Primary aluminum metal production stayed about the same. The mercury mines at Almaden operated at low production levels, with production dropping significantly from 1996. Environmentally driven international pressures to reduce mercury content in finished products and lack of demand continued to impact production.

Among industrial minerals, fluorspar production remained nearly constant, and magnesite and potash production decreased. Quarried mineral products, particularly quarried stone, accounted for a significant share of the value of all mineral production in Spain. In mineral fuels and related materials, natural gas output declined.

Table 2 shows the relation of selected classes of mineral commodities on Spain's balance of payments in relation to the EU and the world.

Trade flows were liberalized after Spain joined the EU, and the differences between Spanish tariffs and EU Common Market tariffs were significantly reduced. The only commodities in which Spain was a net exporter to other EU countries in 1996, thereby reducing its trade deficit, were lead, mercury, nonmetallic mineral manufactured products, slate and other crude industrial minerals, and zinc. With respect to rest-of-world trade, Spain was a net exporter of lead, mercury, nonmetallic mineral manufactured products, and slate. (*See tables 3 and 4.*)

Spain was one of the larger coal producers in the EU, with 26.5 million metric tons per year (all types). Coal reserves are abundant but difficult to mine. Consequently, cost of production was higher, making Spanish coal less competitive than that of many other countries. The leading producer of soft coal was Huelleras del Norte S.A. (Hunosa), and the leading producer of lignite was Empresa Nacional de Electricidad S.A. (Endesa). The country continued to be a large importer of mineral fuels. Spain's production of crude oil was limited.

The mineral industry comprised a mix of state and privately owned companies. Minerals belong to the state under an arrangement known as the "Regalía Principal." The Mining Law of July 19, 1944, as amended, and the Hydrocarbon Law of December 26, 1950, govern the mineral industry. The Ministry of Industry and Energy implement the mineral laws, regulate the private sector, and manage most of the state-owned companies through the Instituto Nacional de Industria (INI), a state holding company. INI and Instituto Geológico y Minero are the principal Government mineral-resource agencies. *(See table 5.)*

Alumina and primary aluminum were produced almost entirely by the Industria Española del Aluminio S.A. (Inespal). Inespal was a holding company with four operating subsidiaries—Aluminio Español S.A., Inespal Extrusión S.A., Inespal Conversión S.A., and Inespal Productos Planos S.A. INI was Inespal's major shareholder. Alúmina Española S.A., a subsidiary near San Ciprián, produced alumina, primary aluminum in standard sheets and ingots, and special alloys.

Copper was mined, mainly at the deposits in Sotiel and Migollas in Huelva, by Navan Resources Ltd. (Almagrera) and by Boliden Apirsa at Aznalcollar (Los Frailes deposit) near Seville.

Expansion of Atlantic Copper Holdings S.A.'s copper refinery in Huelva to 270,000 metric tons per year (t/yr) was completed in 1997 (Engineering and Mining Journal, 1997).

Rio Tinto Minera S.A.'s Spanish exploration subsidiary, Riomin Exploraciones S.A., was continuing feasibility studies on its Las Cruces copper mineralization discovery in Andalucía. The Las Cruces deposit is located about 15 kilometers north of Seville within the Iberian Pyrite belt. Riomin identified an estimated 15 million metric tons (Mt) of predominantly chalcocite ore grading about 6% copper. Also identified was about 1 Mt of gold-bearing (gossan) mineralization containing about 6.5 grams (g/t) per ton of gold. An additional 25 Mt of 3% grade copper and complex polymetallic mineralization containing lead, precious metals, and zinc has been identified (Mining Engineering, 1997).

Gold was being sought in Asturia, northeastern Spain, by Rio Narcea Gold Mines, Ltd., which acquired concessions and permits that previously belonged to the Spanish subsidiary of Anglo American Corp.

Navan Resources Ltd. inaugurated its new polymetallic (copper, lead, and zinc) Aguas Teñidas Mine near Huelva in November 1997. Aguas Teñidas was the first underground operation to be developed in Spain in several years. The operation was expected to be fully operational by 2000 and will supply Navan's nearby Almagrera mill and concentrator with 800,000 t/y to 1 million metric tons per year (Mt/yr) of ore. Navan acquired the mill and concentrator, along with three mines, Sotiel, Sotiel Este, and Miggollas, in June 1997. The mines were said to be largely marginal, low grade, and high cost and to have received little investment in the recent past. Navan was developing 5-year investment plans for the mines to increase tonnage and make the operations more cost effective (Metal Bulletin, 1997a).

The Narcea Gold exploration program was believed to be the largest in Western Europe, involving a total of 1,261 square kilometers (km²) available for mining concessions and investigation permits and 4,200 km² available for prospecting licences located on the gold-bearing belts of Navelgas, Oscos, Rio Narcea, and Salavé.

Mining development was continuing on Narcea Gold's El Valle project. The El Valle project was scheduled to began annual production at 3,000 kilograms (kg) in the first quarter of 1998. A total of 32,127 meters was drilled at 189 locations, raising reported estimated reserves to 63 million grams of gold in 14.7 Mt of ore with an average grade of 4.1 g/t gold.

Three planned open pits contain an estimated 23,045 kg of recoverable gold. Total resources were estimated to be 65,300 kg, excluding resources in the "Black Skarn" deposit, a zone of major copper-gold-silver mineralization located at depth at El Valle (Rio Narcea Gold Mines, Ltd., June 1997, Rio Narcea project, accessed November 6, 1997, at URL http://www.rionarcea.com/news/).

The principal producer of iron ore was Compañia Andaluza de Minas S.A. (CAM), which worked its open pit mine at Marzuesado (Granada). Mining was halted in October 1996, and the mine remained inactive at yearend 1997.

Negotiations were underway with six Spanish companies for the sale of 15% of the shares in the state-owned Aceralia steel company. Aceralia was formerly known as Corporacion Siderúgica Integral (CSI). The companies involved were Aristrain S.A., Gonvarri S.A., Alfonso Gallardo, Megasa S.A., and Marcial Ucin. The Spanish Government said that it would sell this stake to Spanish companies before selling the rest on the stock market. Arbed of Luxembourg had previously purchased 35% of CSI in July 1997 (Metal Bulletin, 1997b).

Production at Boliden's Aznalcollar Mine outside Seville terminated at yearend. However, production started at the nearby Los Frailes, one of the biggest open pit mines in Europe, making Boliden, its operator, one of the largest zinc producers in the world. Ore production at Los Frailes was estimated to be approximately 4 Mt/yr (accessed November 7, 1997, at URL http://www.trellgroup.se/trellgroup/boliden/LOSFRAILES.html).

Los Frailes was closed in early 1998 after a large toxic spill. A waste reservoir ruptured and sent sludge into a nearby river. The spill poisoned some of the areas around the edges of Donana National Park, Europe's largest nature reserve. Boliden was undertaking remedial actions and safety requirements in order to restart operations as soon as possible.

The Banesto Group sold a 24.7% stake in Asturiana de Zinc S.A. (Azsa), the world's fourth-largest zinc producer, to Glencore, a Swiss trading group. The deal, worth about $78.4 million, gave Glencore effective control of the Spanish mining and metals group. The withdrawal from Azsa marked the virtual completion of Banesto's disinvestment from nonbanking interests (Burns, 1997).

Bruno SA, which concentrated on supplying celestite to major producers of strontium carbonate in Europe, was developing a new plant for the processing of celestite at its Montevive quarry operation. The company was also installing new laboratory equipment to prepare celestite for the oil industry to be used in oil and water-based drilling.

Spanish cement production continued to rise from the 1993 low. Cement and clinker exports continued to rise in 1996 to 6.2 Mt; of that total, 2.4 Mt was clinker shipments (International Bulk Journal, 1997).

Through its Spanish subsidiary, Financiera y Minera SA, Ciments Francais proposed a merger with Cementos Molins to create a larger and more powerful cement group with annual sales of about $400 million. The proposal was rejected by stockholders. Ciments Francais, with a 39.1% interest in Cementos Molins, was the principal external stockholder (52%) of the family-owned company (Industrial Minerals, 1997a).

Caustic calcined grades of magnesite was produced in Spain for nonrefractory markets, and crude magnesite was produced from deposits at Eugui, Navarra, and used to make magnesia-based refractory bricks. Output of both has been trending upward in the 1990's. The increase in crude magnesite production was a reflection of the improvements in the steel industry where refractory bricks are used to line furnaces.

The joint venture project of Gwalia Consolidated Ltd. and Desarollo de Recursos Geologicos stopped any further work on its wollastonite exploration. The project was shelved owing to a failure to produce a commercially viable feasibility study (Industrial Minerals, 1997b).

Erkimia of Barcelona and the Government-owned Minas de Almadén y Arrayanes were planning to increase production of strontium carbonate. A new process was being tested at a 400-t/yr pilot plant. At full scale, 2,000 t/yr would be produced at a plant in Cartagena. The operating company for the project will be Quimica del Estroncio in which Minas de Almadén was the major shareholder. Minas de Almadén was also the world's leading mercury producer (Industrial Minerals, 1997c).

Production of coal by Endesa declined from that of 1996. All Spain's coal production was used for the generation of electricity. The Government signed an agreement with coal industry trade unions that was expected to cut about 30% of the work force and public funding in the next 7 years. According to the plan, 7,000 jobs out of the current 24,400 jobs will be lost, and there will be progressive cuts in public aid. The Government stated that the plan will cover the necessary restructuring of the mining sector while meeting EU requirements and reducing taxpayers costs of sustaining the sector. The Government expected that as much as $2.3 billion could be set during the next several years to provide redevelopment aid for northern coal mining regions. A European Coal and Steel Community treaty, set to expire in 2002, allowed Spain to continue subsidies, but called for the country to liberalize its coal market, and to reduce aid and production in this sector. That these conditions had not been met was a source of controversy within the EU (Coal Age, 1997).

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Rio Rosas, 23
28003 Madrid, Spain
Ministerio de Industria y Energia
Doctor Fleming, 7
28036 Madrid, Spain

TABLE 1
SPAIN: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
METALS						
Aluminum:						
Alumina 2/		1,060,000	1,070,600	1,070,580	1,094,797	1,100,000
Metal:						
Primary		364,256	338,106	361,100	361,829	359,904 3
Secondary		99,700	103,500	106,975	153,837	154,000
Cadmium metal		365	387	397	307	324 3
Copper:						
Mine output, Cu content		3,518	4,940	22,614	37,510	37,800
Metal:						
Blister: e/						
Primary		135,800	141,600	134,300	248,500	288,900 3
Secondary		44,800	46,800	47,100	22,400	23,800 3
Total		180,600	188,400	181,400	270,900	312,700 3
Refined:						
Primary		180,600	141,600	117,100	210,000	228,710 3
Secondary		180,600	46,800	47,100	54,000	63,300 3
Total		361,200	188,400	164,200	264,000	292,010 3
Gold, mine output, Au content	kilograms	6,083	5,852	4,131	2,763 r/ 3/	1,824 3
Iron and steel:						
Iron ore and concentrates (including byproduct concentrate), Fe content	thousand tons	1,109	2,086	960	588	58 3
Metal:						
Pig iron	do.	5,394	5,447	5,128	4,127	3,926 3
Ferroalloys, electric furnace	do.	117	70	125	141 r/	175
Steel:						
Crude	do.	12,646	13,547	13,975	12,038	13,644 3
Castings and forgings	do.	165	175	121	123	125
Total		12,811	13,722	14,096	12,161	13,796
Semimanufactures	do.	11,563	12,103	13,175	11,647	12,421 3
Lead:						
Mine output, Pb content		25,300	23,573	30,077	23,826	23,900
Metal: e/						
Primary		62,400	70,400	--	--	--
Secondary		61,000	69,600 r/	80,000 r/	86,000 r/	88,000
Mercury, metal	thousand kilograms	64	393	1,497	862 r/	413 3
Silver, mine output, Ag content	do.	192,418	195,754	123,615	65,878	66,000
Tantalum minerals (tin byproduct): e/						
Gross weight	do.	6,000	5,000	--	--	--
Ta content	do.	1,500	1,200	--	--	--
Tin:						
Mine output, Sn content	do.	2	5	2	2	2
Metal, primary e/		2,000	2,000	1,589	1,200	1,200
Titanium dioxide e/		25,000	20,000	20,000	18,000	18,000
Uranium, mine output, U_3O_8 content		215	301	420	424	425
Zinc:						
Mine output, Zn content		169,892 r/	150,422	172,468 r/	140,100 e/	171,800
Metal, primary and secondary e/		341,600 r/	298,700	354,000	360,800 r/	364,200 3
INDUSTRIAL MINERALS						
Barite		17,656	28,037	28,600	28,000	28,000
Bromine e/		200	200	200	100	100
Calcium carbonate e/		1,500	1,600	1,600	1,650	1,750
Cement, hydraulic, other than natural	thousand tons	22,878	25,131	26,423	25,157	27,632 3
Clays:						
Attapulgite e/		85,000	85,000	94,266	94,000	90,000
Bentonite e/		150,000	150,000	172,265	172,000	170,000
Kaolin, washed		148,000	290,000	316,074	315,000	330,000
Other e/	thousand tons	13,000	13,650	25,300	15,000	20,000
Diatomite and tripoli		38,000	40,000	28,271	30,000	30,000
Feldspar		239,000	250,000	379,284	415,000 r/	455,000

See footnotes at end of table.

TABLE 1--Continued

SPAIN: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
INDUSTRIAL MINERALS--Continued						
Fluorspar:						
Acid-grade		82,000	97,000	108,205	109,085	110,000
Metallurgical-grade		5,000	10,000	10,206	7,441	10,000
Total		87,000	107,000	118,411	116,526	120,000
Gypsum and anhydrite, crude	thousand tons	7,250	7,300	7,495	7,500	7,500
Kyanite, andalusite, related materials e/		3,000	3,500	2,000	2,000	2,500
Lime, hydrated and quicklime e/	thousand tons	1,200	1,000	1,500	1,500	1,500
Magnesite:						
Calcined		131,000	135,000	150,000 e/	150,000 e/	170,000
Crude e/		400,000	400,000	491,397	490,000	500,000
Mica e/		250	250	200	200	200
Nitrogen, N content of ammonia	thousand tons	354	452 r/	453 r/	466 r/	497 /3
Pigments, mineral: e/						
Ocher		8,000	8,000	7,000	8,000	8,000
Red iron oxide		16,000	16,000	15,000	15,000	15,000
Potash, K_2O equivalent		660,900	683,700	759,923	680 r/	605 3/
Pumice e/		700,000	700,000	700,000	700,000	600,000
Pyrite, including cuprous, gross weight	thousand tons	722	746	875	1,042 r/	993 3/
Salt:						
Rock, including byproduct from potash works	do.	2,510	2,850	2,215	2,400	2,200
Marine and other	do.	900	850	1,471	1,500	1,400
Sand and gravel, silica sand e/ 4/	do.	2,200	2,000	5,105 r/ 3/	5,300 r/	5,800
Sepiolite e/		400,000	375,000	375,000	400,000	375,000
Sodium compounds, n.e.s.:						
Soda ash, manufactured e/	thousand tons	500	500	500	500	500
Sulfate, natural:						
Glauberite, Na_2SO_4 content		260,000 e/	350,000 e/	637,525	630,000	600,000
Thenardite, Na_2SO_4 content		158,000 e/	250,000	176,600	175,000	175,000
Manufactured e/		150,000	150,000	150,000	100,000	125,000
Stone, calcareous: e/						
Chalk	thousand tons	500	400	136	140	150
Dolomite	do.	4,500	4,400	4,608	5,100 r/	5,400
Limestone	do.	1,600	1,450	2,326	2,400	2,500
Marble	do.	2,130	2,132	1,978	2,460 r/ 3/	2,880
Marl	do.	4,000	5,000	5,145	5,200	8,500
Basalt	do.	4,480	4,500	1,195	1,200	1,400
Granite	do.	1,170	1,338	1,800	2,000	2,000
Ophite	do.	2,500	2,500	2,165	2,200	2,200
Phonolite	do.	500	600	677	650	650
Porphyry	do.	500	500	783	800	800
Quartz	do.	1,600	1,500	1,445	1,500	1,500
Quartzite	do.	1,000	2,000	2,255	2,200	2,400
Sandstone	do.	1,600	1,500	2,629	2,600	2,500
Serpentine	do.	800	900	979	900	900
Other	do.	600	600	619	600	600
Strontium minerals: e/						
Gross weight		50,000	50,000	106,000	100,000	100,000
Sr_2O_4 content		12,000	12,000	99,000	94,000	94,000
Sulfur:						
S content of pyrites	thousand tons	327	350	403	479	480
Byproduct: e/						
Of metallurgy	do.	250	250	250	250	250
Of petroleum	do.	100	100	100	100	100
Of coal (lignite) gasification	do.	2	2	2	2	2
Total sulfur e/	do.	679	702	755	831	832
Talc and steatite e/		65,000	65,000	112,000	100,000	100,000

See footnotes at end of table.

TABLE 1--Continued
SPAIN: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
MINERAL FUELS AND RELATED MATERIALS						
Coal (marketable):						
Anthracite	thousand tons	6,050	6,756	6,275	6,487	6,678 3/
Bituminous	do.	13,300	12,000	11,425	11,262	7,200
Lignite	do.	17,457	15,499	10,776	9,604	12,577 3/
Total	do.	36,807	34,255	28,476	27,353	26,455
Coke, metallurgical e/	do.	3,000	3,000	2,438	2,410	2,500
Gas, natural (marketed)	million cubic meters	633	197	422	466	178 3/
Peat e/		70,000	70,000	70,000	50,000	60,000
Petroleum:						
Crude	thousand 42-gallon barrels	6,376	5,879	4,747	3,759	2,766 3/
Refinery products:						
Liquefied petroleum gas	do.	18,600	19,848	21,019	17,655	16,000
Naphtha	do.	19,600	19,006	12,900	19,797	18,000
Gasoline, motor	do.	79,300	84,388	82,544	83,113	83,000
Jet fuel	do.	24,500	29,192	32,064	33,504	33,000
Kerosene	do.	25,100	29,249	12,555	581	600
Distillate fuel oil	do.	114,000	121,695	124,097	129,080	128,000
Residual fuel oil	do.	97,900	94,912	80,366	73,213	74,000
Other e/	do.	30,000	30,000	52,696	50,624	50,000
Refinery fuel and losses e/	do.	12,000	12,000	13,531	12,026	12,000
Total e/	do.	421,000	440,290	431,772	419,593	414,600

e/ Estimated. r/ Revised.

1/ Table includes data available through September 1997.

2/ Reflects aluminum hydrate.

3/ Reported figure.

4/ Includes sand obtained as a byproduct of feldspar and kaolin production.

TABLE 2
SPAIN: BALANCE OF PAYMENTS, SELECTED MINERAL COMMODITIES IN 1996 1/

(Thousand dollars)

Mineral commodity	Exports to EU	Imports from EU	Net gain or (loss)	Exports to the world	Imports from the world	Net gain or (loss)
Crude industrial minerals:						
Feldspar	$2,469	$3,624	($1,155)	$3,527	$11,258	($7,731)
Magnesite	6	234	(228)	919	1,321	(402)
Slate	4,227	2	4,225	4,893	31	4,862
Other	265,539	176,818	88,721	398,362	441,770	(43,408)
Total	272,241	180,678	91,563	407,701	454,380	(46,679)
Metalliferous ores:						
Copper	2,487	422,983	(420,496)	21,649	503,180	(481,531)
Lead	5,802	15	5,787	9,909	159	9,750
Zinc	15,849	6,172	9,677	21,772	128,351	(106,579)
Other (including waste and scrap)	149,930	350,359	(200,429)	248,229	1,368,880	(1,120,651)
Total	174,068	779,529	(605,461)	301,559	2,000,570	(1,699,011)
Nonmetallic mineral manufactures	448,283	167,415	280,868	860,383	320,858	539,525
Metals:						
Iron and steel	2,225,577	2,907,797	(682,220)	3,679,626	3,664,190	15,436
Magnesium, metal including alloys:						
Unwrought	20	3,592	(3,572)	20	5,246	(5,226)
Semimanufactures	150	673	(523)	173	1,110	(937)
Total	170	4,265	(4,095)	193	6,356	(6,163)
Mercury	684	735	(51)	2,684	1,006	1,678
Other nonferrous metals	1,290,076	1,283,023	7,053	1,651,474	1,708,119	(56,645)
Total, metals	3,516,507	4,195,820	(679,313)	5,333,977	5,379,671	(45,694)
Mineral fuels	818,930	1,306,846	(487,916)	2,525,495	11,093,929	(8,568,434)

1/ Table prepared by Glenn J. Wallace, International Data Unit.

TABLE 3
SPAIN: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

			Destinations	
Commodity		Total	United States	Other (principal)
METALS				
Akali and akaline-earth metals:				
Alkali metals		45	(2/)	India 4; Portugal 1; unspecified Asia 40.
Alkaline-earth metals		1	–	All to Canada.
Aluminum:				
Ore and concentrate		2,451	–	Portugal 1,698; Italy 453; France 299.
Oxides and hydroxides		440,021	–	Netherlands 110,856; Russia 85,986; United Kingdom 73,099.
Metal including alloys:				
Scrap		5,130	90	France 1,841; Netherlands 855; Germany 697
Unwrought		137,279	48	Italy 34,203; Portugal 24,207; Netherlands 20,760.
Semimanufactures		180,098	23,786	Italy 36,959; France 27,308; United Kingdom 15,447.
Antimony, metal including alloys, all forms		44	–	Germany 26; Mexico 8; France 5.
Bismuth, metal including alloys, all forms		27	6	Belgium-Luxembourg 18; Czech Republic 1; Portugal 1.
Cadmium, metal including alloys, all forms		380	–	Netherlands 375; France 5.
Chromium:				
Ore and concentrate		1,126	–	Portugal 1,063; France 21; Morocco 21.
Oxides and hydroxides		524	–	Italy 144; France 52; Portugal 46.
Metal including alloys, all forms		584	–	France 420; United Kingdom 30; Portugal 25.
Cobalt:				
Ore and concentrate		4	–	Mainly to France.
Oxides and hydroxides		24	–	Portugal 10; Italy 5; Netherlands 5.
Metal including alloys, all forms		49	8	Republic of Korea 15; Netherlands 12; Philippines 9.
Columbium and tantalum:				
Ore and concentrate 3/		14	6	Netherlands 6; Portugal 2.
Tantalum metal including alloys, all forms		10	–	France 5; Germany 5.
Copper:				
Ore and concentrate		81,981	–	Russia 26,980; Japan 20,459; China 17,524.
Metal including alloys:				
Scrap		39,750	194	Germany 11,993; Italy 5,551; France 5,447.
Unwrought		116,836	3,394	United Kingdom 33,664; Italy 29,950; France 27,848.
Semimanufactures		104,367	381	Italy 37,378; Portugal 27,564; France 10,660.
Germanium, metal including alloys, all forms	value, thousands	$66	–	All to Israel.
Gold:				
Waste and sweepings	do.	$100	$23	Germany $38; Switzerland $24; Venezuela $13.
Metal including alloys, unwrought and partly wrought	kilogram	15,201	1,345	Portugal 7,703; United Kingdom 5,563; Italy 518.
Iron and steel:				
Ore and concentrate:				
Excluding roasted pyrite		975,353	11,000	Netherlands 418,492; United Kingdom 342,398; Grance 150,923.
Pyrite, roasted		198,896	–	Greece 126,058; Israel 40,730; Lebanon 23,913.
Metal:				
Scrap		21,381	1	France 13,996; Italy 2,626; Portugal 1,655.
Pig iron, cast iron, related materials		1,590	191	Cuba 727; France 173; Germany 108.
Ferroalloys:				
Ferrochromium		717	81	Portugal 309; France 154; Cuba 152.
Ferromanganese		22,174	926	Germany 7,980; Italy 5,470; United Kingdom 1,590.
Ferronickel		1	–	All to Portugal.
Ferrosilicomanganese		54,685	2,888	Germany 13,904; Italy 10,299; Portugal 7,181
Ferrosilicon		3,278	6	Portugal 2,260; United Kingdom 500; France 431.
Silicon metal 4/		10,781	1,175	United Kingdom 4,218; France 3,684; Italy 713.

See footnotes at end of table.

TABLE 3--Continued
SPAIN: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
METALS--Continued				
Iron and steel--Continued:				
Metal--Continued:				
Ferroalloys--Continued:				
Unspecified		602	--	Portugal 325; Netherlands 65; Cuba 59.
Steel, primary forms		245,137	3,272	France 95,686; Italy 63,962; India 18,059.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated		827,165	22,670	France 155,219; Portugal 92,999; Italy 74,812.
Clad, plated, coated		627,616	75,862	France 104,531; United Kingdom 93,144; Italy 67,466.
Of alloy steel	value, thousands	$750,215	$117,466	Germany $125,038; Italy $109,991; France $87,615.
Bars, rods, angles, shapes, sections	tons, thousands	2,751	220	Portugal 488; France 280; United Kingdom 205.
Rails and accessories		11,850	377	Germany 2,273; Argentina 1,819; Thailand 1,482.
Wire		174,863	2,119	France 65,451; Portugal 35,751; Iran 20,217.
Tubes, pipes, fittings		459,966	22,904	France 90,489; Portugal 62,383; Italy 31,365.
Lead:				
Ore and concentrate		41,501	--	France 13,131; Italy 11,141; Morocco 5,380.
Oxides		2,760	--	Portugal 621; Egypt 380; Saudi Arabia 300.
Metal including alloys:				
Scrap		1,734	--	France 1,682; Austria 49; Portugal 9.
Unwrought		4,992	--	Portugal 4,661; Argentina 62; Cyprus 42.
Semimanufactures	value, thousands	$757	--	Netherlands $459; Turkey $127; United Kingdom $83.
Magnesium, metal including alloys:				
Scrap	do.	$76	--	All to United Kingdom.
Unwrought		2	--	Finland 1; Portugal 1.
Semimanufactures		23	1	France 18; Germany 3; Morocco 1.
Manganese:				
Ore and concentrate, metallurgical-grade		2,854	--	France 1,472; Brazil 400; United Kingdom 357.
Oxides and hydroxides		164	--	Portugal 78; Cuba 45; Poland 20.
Metal including alloys, all forms		1,563	--	Norway 498; Germany 269; Italy 266.
Mercury		549	14	Hong Kong 121; Netherlands 53; Germany 46.
Molybdenum:				
Ore and concentrate, roasted		2	--	All to Italy.
Metal including alloys:				
Unwrought, including waste and scrap	value, thousands	$48	--	Germany $39; France $4; Portugal $3.
Semimanufactures	do.	$451	$5	Germany $105; France $82; Brazil $60.
Nickel:				
Ore and concentrate		10	--	Morocco 5; Cuba 3; Portugal 2.
Matte and speiss		7	--	All to Portugal.
Metal including alloys:				
Scrap		302	--	United Kingdom 127; Belgium-Luxembourg 69; Netherlands 49.
Unwrought		41	--	Netherlands 30; Portugal 6; United Kingdom 4.
Semimanufactures		162	5	Germany 47; United Kingdom 38; Italy 35.
Platinum-group metals:				
Waste and sweepings	value, thousands	$6,874	--	All to United Kingdom.
Metal including alloys, unwrought and partly wrought	do.	$5,353	$39	Germany $2,360; France $1,989; United Kingdom $602.
Silver, metal including alloys, unwrought and partly wrought	do.	$36,059	$111	Germany $9,805; Portugal $9,336; France $6,875.
Tin, metal including alloys:				
Scrap		28	--	Belgium-Luxembourg 24; France 4.
Unwrought	value, thousands	$823	--	Italy $334; Portugal $178; Germany $177.
Semimanufactures		99	(2/)	Italy 75; Cuba 9; Mexico 8.

See footnotes at end of table.

TABLE 3--Continued
SPAIN: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations United States	Other (principal)
METALS--Continued				
Titanium:				
Ore and concentrate		171	(2/)	Portugal 117; Morocco 31; Cuba 21.
Oxides		7,301	--	Canada 6,235; Malaysia 601; Libya 80.
Metal including alloys:				
Unwrought, including waste and scrap		61	--	Israel 20; Netherlands 16; Malta 7.
Semimanufactures		302	(2/)	United Kingdom 93; Brazil 52; Italy 41.
Tungsten:				
Ore and concentrate		11	11	
Metal including alloys:				
Unwrought, including waste and scrap		11	--	Finland 7; France 1; unspecified Asia 3.
Semimanufactures		9	--	Hungary 7; Belgium-Luxembourg 1; Germany 1
Uranium and thorium, uranium metal including all forms	value, thousands	$3	--	Unspecified countries $3.
Zinc:				
Ore and concentrate		14	6	Netherlands 6; Portugal 2.
Oxides		2,702	--	France 1,847; Portugal 571; Italy 115.
Scrap		2,251	--	France 975; Italy 555; Belgium-Luxembourg 208.
Unwrought		198,139	83,465	Netherlands 48,965; France 31,271; Italy 12,339.
Semimanufactures 5/	value, thousands	$622	--	Portugal $364; Cuba $78; France $45.
Zirconium:				
Ore and concentrate		3,027	--	United Arab Emirates 525; United Kingdom 500; Tunisia 427.
Metal including alloys, semimanufactures		90	--	Singapore 47; Tunisia 20; United Arab Emirates 14.
Other:				
Ores and concentrates		28,876	--	Portugal 16,777; Germany 11,963; Italy 87.
Oxides and hydroxides		26,457	37	France 24,253; Netherlands 749; Italy 479
Ashes and residues		77,852	39	Belgium-Luxembourg 67,312; France 5,506, Portugal 2,284.
Base metals including alloys, all forms		22	--	All to Portugal.
Metalloids 6/		36	--	United Kingdom 18; Germany 6; Cuba 5.
Precious metals, n.e.s.:				
Ores and concentrates	kilograms	26,250	--	All to Hungary.
Waste and sweepings	do.	9,353	--	Belgium-Luxembourg 7,763; France 1,239; Thailand 326.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural, corundum, emery, pumice, etc.		3,062	8	Germany 1,414; Italy 715; Portugal 340.
Artificial corundum		1,676	--	Italy 1,388; Portugal 135; Denmark 70.
Dust and powder of precious and semiprecious stones including diamonds	value, thousands	$732	--	Portugal $461; Brazil $191; Belgium-Luxembourg 430.
Grinding and polishing wheels and stones		7,331	73	Germany 1,343; France 868; Portugal 565.
Asbestos, crude		625	--	Cuba 338; Mauritania 220; Israel 47.
Barite and witherite		64,381	--	United Kingdom 26,547; Venezuela 20,796, Algeria 4,808.
Boron:				
Crude natural borates		3,269	--	Italy 1,172; Portugal 755; Tunisia 508.
Oxides and acids		3,372	--	Italy 3,210; France 85; Portugal 64.
Bromine, fluorine, iodine		40	--	Germany 36; France 1; Philippines 1.
Cement	tons, thousands	6,206	1,755	Algeria 780; Ghana 772; Cote d' Ivoire 343.
Chalk		44,735	--	Germany 12,122; France 6,429; Italy 1,014.
Clays, crude:				
Bentonite		12,466	--	Portugal 5,496; Japan 2,548; France 2,391.
Kaolin		137,994	4	Italy 51,485; Germany 25,417; Finland 19,220
Unspecified		14,376	--	United Kingdom 40,553; Netherlands 29,616; Germany 25,013.

See footnotes at end of table.

TABLE 3--Continued
SPAIN: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
INDUSTRIAL MINERALS--Continued				
Cryolite and chiolite		5	--	Portugal 4; United Kingdom 1.
Diamond, natural:				
Gem, not set or strung	value, thousands	$1,105	--	Belgium-Luxembourg $798; Andorra $218; Italy $61.
Industrial stones	do.	$665	--	Belgium-Luxembourg $472; United Kingdom $102; Germany $65.
Diatomite and other infusorial earth		2,122	--	France 810; Italy 424; Sweden 181.
Feldspar		29,809	--	Portugal 16,757; Italy 6,866; Morocco 3,846.
Fertilizer materials:				
Crude, n.e.s.		26,190	--	Andorra 7,304; Italy 6,949; Portugal 5,817.
Manufactured:				
Ammonia		12,334	--	Morocco 10,292; Iran 1,062; Thailand 524.
Nitrogenous		440,556	--	Netherlands 135,000; Germany 82,089; France 76,591.
Phosphatic		2,412	--	Portugal 1,092; Mexico 412; Saudi Arabia 192.
Potassic		715,780	--	France 521,374; Italy 50,562; Belgium-Luxembourg 28,078.
Unspecified and mixed		255,628	22	Italy 70,877; Portugal 52,689; France 46,205.
Fluorspar		19,897	--	United Kingdom 14,935; Netherlands 4,143; Portugal 529.
Graphite, natural		126	--	Portugal 63; Venezuela 33; Morocco 22.
Gypsum and plaster	tons, thousands	2,470	508	United Kingdom 562; Denmark 243; Sweden 209.
Lime		36,492	--	France 22,000; Portugal 8,785; Equatorial Guinea 1,740.
Magnesium compounds:				
Magnesite, crude		1,385	--	Saudi Arabia 1,345; Cuba 22; France 18.
Oxides and hydroxides		132,013	100	France 50,462; United Kingdom 39,063; Netherlands 9,482.
Mica:				
Crude including splittings and waste		1,218	--	United Kingdom 994; Italy 92; Germany 47.
Worked including agglomerated splittings		132	(2/)	Germany 81; France 18; Austria 10.
Nitrates, crude		4,440	--	Venezuela 4,248; Ghana 185; Portugal 7.
Phosphates, crude		49	--	United Kingdom 20; Portugal 9; Morocco 3.
Pigments, mineral, iron oxides and hydroxides, processed		16,341	1,374	Italy 2,908; United Kingdom 1,255; France 1,163.
Potassium salts, crude		9,465	--	All to Portugal.
Precious and semiprecious stones other than diamond:				
Natural	value, thousands	$553	$1	Poland $93; Germany $87; Thailand $80.
Synthetic	do.	$1,733	$86	Portugal $545; Switzerland $472; Thailand $163.
Pyrite, unroasted		26,090	--	Turkey 26,083; Argentina 4; Morocco 3.
Salt and brine		896,043	159,525	Norway 170,008; France 167,530; United Kingdom 100,466.
Sodium compounds, n.e.s.:				
Soda ash, manufactured		187,037	--	Italy 34,469; Brazil 33,070; France 27,351.
Sulfate, manufactured		560,800	--	Italy 89,719; United Kingdom 72,215; France 60,483.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked		638,056	11,131	Italy 240,642; Portugal 59,376; Gibraltar 28,433.
Worked		834,183	42,383	France 245,027; Germany 156,627; Hong Kong 62,561.
Dolomite, chiefly refractory-grade		168,847	--	United Kingdom 132,719; Germany 7,350; France 5,730.
Gravel and crushed rock		418,398	--	Andorra 213,110; Portugal 170,843; Gibraltar 23,624.

See footnotes at end of table.

TABLE 3--Continued
SPAIN: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
INDUSTRIAL MINERALS--Continued				
Stone, sand and gravel--Continued:				
Limestone other than dimension		276,837	--	Belgium-Luxembourg 133,730; Ghana 50,000; Togo 45,000.
Quartz and quartzite		492,424	--	Norway 416,013; Canada 43,391; France 14,068.
Sand other than metal-bearing		713,697	--	Andorra 418,064; Italy 177,978; Portugal 85,708.
Sulfur:				
Elemental:				
Crude including native and byproduct		29,533	--	Portugal 9,368; France 7,182; Italy 6,761.
Colloidal, precipitated, sublimed		652	--	Mainly to France.
Dioxide		1,490	--	Portugal 1,327; Sweden 110; United Kingdom 49.
Sulfuric acid		391,779	39,901	Turkey 100,901; Portugal 62,358; France 46,664.
Talc, steatite, soapstone, pyrophyllite		39,583	--	Belgium-Luxembourg 24,316; Italy 6,187; Portugal 5,293.
Vermiculite, perlite, chlorite		1,542	--	France 1,088; Italy 316; Andorra 74.
Other:				
Crude	tons, thousands	1,206	(2/)	Belgium-Luxembourg 394; France 268; Germany 239.
Slag and dross, not metal-bearing		78,468	--	Portugal 68,320; France 4,967; Cuba 1,952
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural		20,703	--	Portugal 14,757; Andorra 4,329; Senegal 1,480.
Carbon black		21,676	4	United Kingdom 6,542; France 5,416; Italy 5,195.
Coal:				
Anthracite		180	180	
Bituminous		223	--	Portugal 204; Andorra 19.
Briquets of anthracite and bituminous coal		11	--	All to Morocco.
Coke and semicoke		94,597	--	France 38,570; United Kingdom 11,619; Morocco 8,701.
Gas, natural: Liquefied	value, thousands	$1	--	All to Portugal.
Peat including briquets and litter		3,912	--	Germany 2,335; France 995; Turkey 320
Petroleum:				
Crude	value, thousands	$12	--	Cuba $6; France $5; Tunisia $1.
Refinery products:				
Liquefied petroleum gas		171,829	--	Morocco 76,336; Portugal 30,728; Senegal 27,021.
Gasoline	tons, thousands	2,607	460	France 317; Netherlands 313; Belgium-Luxembourg 304.
Mineral jelly and wax		35,102	--	Portugal 6,791; France 3,925; Morocco 3,565
Kerosene and jet fuel	tons, thousands	2,459	--	Nigeria 155; United Kingdom 85; unspecified countries 1,927.
Distillate fuel oil	do.	1,718	--	Morocco 321; France 242; unspecified countries 417.
Lubricants		330,500	44	India 70,801; Portugal 45,820; United Kingdom 23,295.
Residual fuel oil	tons, thousands	5,137	925	Gibraltar 1,019; Italy 447; unspecified countries 1,554.
Bitumen and other residues		577,441	61,805	Portugal 185,925; France 115,964; Italy 62,846.
Bituminous mixtures		10,044	--	Portugal 4,064; Netherlands 2,087; France 1,226.
Petroleum coke		38,008	--	Portugal 13,641; United Kingdom 11,097; Germany 6,915.

1/ Table prepared by Glenn J. Wallace.

2/ Less than 1/2 unit.

3/ May include vanadium.

TABLE 3--Continued

SPAIN: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

4/ May include high-purity silicon.

5/ Includes dust, flakes, and powders.

6/ Reported under SITC item number as "selenium, tellurium, phosphorus, arsenic, etc."

Source: United Nations Statistical Office (microfiche).

TABLE 4
SPAIN: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

			Sources	
Commodity		Total	United States	Other (principal)
METALS				
Akali and akaline-earth metals:				
Alkali metals		75	(2/)	Ireland 32; United Kingdom 15; France 12.
Alkaline-earth metals		146	1	Russia 70; France 39; Netherlands 18.
Aluminum:				
Ore and concentrate	tons, thousands	2,457	--	Guinea 2,366; Greece 42; China 32.
Oxides and hydroxides		39,912	170	Germany 18,439; France 15,612; Netherlands 3,007.
Metal including alloys:				
Scrap		41,781	1,903	France 13,612; Portugal 6,912; Russia 5,855.
Unwrought		127,594	280	Russia 58,130; France 12,777; Norway 8,392.
Semimanufactures		125,146	2,888	Germany 29,971; Italy 24,338; France 23,577.
Antimony, metal including alloys, all forms		1,179	--	China 1,089; Netherlands 33; Viet Nam 20.
Beryllium, metal including alloys, all forms	value, thousands	$12	--	All from Italy.
Bismuth, metal including alloys, all forms		191	(2/)	Germany 81; United Kingdom 60; Belgium-Luxembourg 30.
Cadmium, metal including alloys, all forms		13	--	Germany 11; Italy 2.
Chromium:				
Ore and concentrate		8,696	(2/)	South Africa 7,143; Turkey 1,036; Netherlands 195.
Oxides and hydroxides		3,471	(2/)	United Kingdom 1,438; Russia 565; Germany 542.
Metal including alloys, all forms		299	(2/)	Russia 112; Germany 73; China 23.
Cobalt:				
Ore and concentrate		31	--	Finland 30; Belgium-Luxembourg 1.
Oxides and hydroxides		540	--	Belgium-Luxembourg 224; Finland 181; Netherlands 60.
Metal including alloys, all forms		190	9	Belgium-Luxembourg 75; United Kingdom 53; France 24.
Columbium and tantalum:				
Ore and concentrate 3/	value, thousands	$1	--	All from United Kingdom.
Tantalum metal including alloys, all forms		6	(2/)	United Kingdom 5.
Copper:				
Ore and concentrate		736,576	10,824	Indonesia 460,761; Chile 128,146; Portugal 100,000.
Matte and speiss including cement copper		78	--	France 76; Germany 1; Portugal 1.
Metal including alloys:				
Scrap		59,273	2,509	France 13,406; Germany 9,530; Argentina 9,102.
Unwrought		41,419	36	Belgium-Luxembourg 13,831; Chile 7,238; France 4,836.
Semimanufactures		159,563	1,957	France 42,957; Italy 34,355; Germany 26,557.
Germanium, metal including alloys, all forms	value, thousands	$130	--	Belgium-Luxembourg $107; Israel $23.
Gold:				
Waste and sweepings	do.	$1,144	--	All from Portugal.
Metal including alloys, unwrought and partly wrought	kilograms	28,213	971	United Kingdom 21,480; Sweden 2,065; Germany 1,244.
Iron and steel:				
Ore and concentrate:				
Excluding roasted pyrite	tons, thousands	6,106	--	Brazil 3,872; Mauritania 870; Australia 559.
Pyrite, roasted		465	--	Belgium-Luxembourg 248; Italy 216.
Metal:				
Scrap	tons, thousands	4,480	67	France 1,416; United Kingdom 1,393; Netherlands 419.
Pig iron, cast iron, related materials		614,332	1,322	Russia 331,022; Sweden 129,542; Venezuela 51,587.
Ferroalloys:				
Ferrochromium		146,344	--	South Africa 96,396; Zimbabwe 12,252; Finland 9,507.
Ferromanganese		18,364	--	France 10,310; Norway 5,707; South Africa 1,668.
Ferronickel		28,043	--	New Caledonia 10,362; Indonesia 7,307; Greece 4,352.
Ferrosilicochromium		5,719	--	Zimbabwe 3,648; China 1,997; Germany 74.
Ferrosilicomanganese		21,563	--	Norway 13,813; China 3,827; France 2,801.
Ferrosilicon		33,346	641	Norway 18,222; Macedonia 3,405; Brazil 3,300.
Silicon metal 4/		3,649	(2/)	Russia 1,455; China 1,219; Norway 409.
Unspecified		12,661	41	France 2,651; Brazil 1,617; United Kingdom 1,404.
Steel, primary forms		412,995	27,868	Brazil 126,586; Mexico 79,493; Russia 65,490.

See footnotes at end of table.

TABLE 4--Continued

SPAIN: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity	Total	Sources	
		United States	Other (principal)
METALS--Continued			
Iron and steel--Continued:			
Metal--Continued:			
Steel, primary forms--Continued:			
Flat-rolled products:			
Of iron or nonalloy steel:			
Not clad, plated, coated tons, thousands	2,625	69	France 861,668; Germany 330,387; United Kingdom 281,299.
Clad, plated, coated	976,643	10,282	France 308,965; Germany 253,410; United Kingdom 121,935.
Of alloy steel	231,201	313	France 80,753; Germany 58,915; Belgium-Luxembourg 25,504.
Bars, rods, angles, shapes, sections	817,222	297	Italy 215,471; United Kingdom 174,361; Germany 80,179.
Semimanufactures:			
Rails and accessories	8,888	6	Germany 1,797; Belgium-Luxembourg 1,525; France 1,524.
Wire	74,842	56	Belgium-Luxembourg 16,994; Italy 14,815; Portugal 12,635.
Tubes, pipes, fittings	469,907	477	Italy 129,951; Germany 99,671; France 81,588.
Lead:			
Ore and concentrate	197	--	Morocco 193; France 3; Germany 1.
Oxides	3,301	10	Portugal 2,667; Italy 415; Peru 140.
Metal including alloys:			
Scrap	3,532	--	Portugal 2,766; Tunisia 307; Morocco 284.
Unwrought	63,436	--	Morocco 23,830; Bulgaria 15,844; France 11,805.
Semimanufactures value, thousands	$3,876	--	France $2,272; United Kingdom $673; Ireland $621.
Magnesium, metal including alloys:			
Unwrought	1,206	--	France 345; Russia 227; Netherlands 171.
Semimanufactures	241	(2/)	Hungary 72; Switzerland 64; Italy 46.
Manganese:			
Ore and concentrate, metallurgical-grade	402,092	4	South Africa 222,008; Brazil 78,724; Ghana 30,355.
Oxides and hydroxides	1,045	--	Brazil 483; South Africa 258; Norway 124.
Metal including alloys, all forms	2,054	--	China 1,502; United Kingdom 193; Mexico 80.
Mercury	299	--	Italy 140; Germany 59; Belgium-Luxembourg 42.
Molybdenum:			
Ore and concentrate:			
Roasted	2,442	321	Chile 1,924; Belgium-Luxembourg 100; Netherlands 91.
Unroasted	47	--	United Kingdom 46; South Africa 1.
Metal including alloys:			
Unwrought, including waste and scrap	33	4	Germany 18; United Kingdom 10; France 1.
Semimanufactures	19	3	Austria 11; Germany 3; United Kingdom 1.
Nickel:			
Ore and concentrate	28	--	Mainly from the Netherlands.
Matte and speiss	86	--	Canada 77; Cuba 8; France 1.
Metal including alloys:			
Scrap	376	--	Portugal 343; France 28; Brazil 2.
Unwrought	10,796	44	Russia 2,922; Australia 2,096; Canada 2,032.
Semimanufactures	3,246	137	Netherlands 1,318; Germany 987; Italy 300.
Platinum-group metals:			
Waste and sweepings value, thousands	$1,623	--	Brazil $660; France $398; Chile $284.
Metal including alloys, unwrought and partly wrought do.	$13,599	--	United Kingdom $5,956; Germany $2,023; Switzerland $2,022.
Silver:			
Ore and concentrate do.	$4,802	$190	Indonesia $2,761; Morocco $1,160; Chile $691.
Metal including alloys, unwrought and partly wrought do.	$59,949	$1,948	France $25,901; Italy $12,609; United Kingdom $6,125.
Tin:			
Ore and concentrate	66	--	All from Nigeria.

See footnotes at end of table.

TABLE 4--Continued
SPAIN: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Sources	
			United States	Other (principal)
METALS--Continued				
Tin--Continued:				
Metal including alloys:				
Scrap		81	--	France 80; Portugal 1.
Unwrought		25,869	229	Malaysia 21,486; China 1,497; Germany 595.
Semimanufactures	value, thousands	$3,603	$37	France $1,397; United Kingdom $958; Germany $799.
Titanium:				
Ore and concentrate		138,171	--	Australia 134,954; South Africa 1,278; Finland 801.
Oxides		9,532	44	Saudi Arabia 2,622; Australia 2,143; China 1,083.
Metal including alloys:				
Unwrought, including waste and scrap		1,107	112	Germany 559; Russia 197; Ukraine 42.
Semimanufactures		358	181	Italy 76; Germany 46; United Kingdom 19.
Tungsten:				
Ore and concentrate		6	--	All from Israel.
Metal including alloys:				
Unwrought, including waste and scrap		59	(2/)	Netherlands 26; China 15; France 7.
Semimanufactures		40	14	France 19; Germany 3; Netherlands 3.
Uranium and thorium, metal including all forms:				
Uranium	value, thousands	$1	$1	
Thorium	do.	$22	--	Canada $14; United Kingdom $5; Germany $3.
Zinc:				
Ore and concentrate		521,113	20,939	Canada 279,824; Morocco 103,763; Peru 60,106.
Oxides		26,952	58	France 10,508; Italy 5,228; Portugal 3,758.
Metal including alloys:				
Scrap		319	--	France 123; Portugal 100; Italy 73.
Unwrought		11,853	--	Belgium-Luxembourg 7,438; Italy 3,200; France 710.
Semimanufactures 5/		4,140	4	France 1,692; Germany 955; Belgium-Luxembourg 835.
Zirconium:				
Ore and concentrate		83,582	160	South Africa 48,187; Australia 28,234; Germany 2,268.
Metal including alloys:				
Unwrought, including waste and scrap		100	--	Mainly from Belgium-Luxembourg.
Semimanufactures		33	8	Germany 25.
Other:				
Ores and concentrates		292	--	Germany 88; Austria 86; France 31.
Oxides and hydroxides		5,746	1,016	Germany 1,770; France 1,161; United Kingdom 424.
Ashes and residues		104,641	16,572	France 26,171; Italy 17,465; Australia 16,498.
Base metals including alloys, all forms	value, thousands	$107	$9	Switzerland $30; Germany $29; United Kingdom $18.
Metalloids 6/		323	11	China 145; United Kingdom 104; Gemany 10.
Precious metals, n.e.s.:				
Ores and concentrates	kilograms	13,073	169	Indonesia 12,511; Chile 243; Hungary 150.
Waste and sweepings	do.	86,529	72,600	Portugal 11,822; Brazil 1,980; France 105.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.		1,765	45	Turkey 526; Germany 372; Greece 355.
Artificial corundum		17,003	278	France 4,174; Cambodia 3,710; China 2,512.
Dust and powder of precious and semiprecious stones including diamonds	value, thousands	$15,763	$671	Belgium-Luxembourg $5,915; Ireland $5,374; Germany $2,615.
Grinding and polishing wheels and stones		5,916	17	Italy 2,023; Germany 1,319; France 839.
Asbestos, crude		27,030	9	Canada 15,450; Zimbabwe 6,721; Russia 3,362.
Barite and witherite		10,429	--	Morocco 6,500; Germany 2,025; China 1,297.
Boron:				
Crude natural borates		93,935	--	Turkey 81,530; Argentina 12,306; Belgium-Luxembourg 96.
Oxides and acids		15,776	11,541	Turkey 2,575; Italy 620; France 446.
Bromine, fluorine, iodine		820	50	Germany 369; Netherlands 136; Belgium-Luxembourg 77.
Cement	tons, thousands	3,608	(2/)	Turkey 1,549; Greece 1,026; Romania 400.
Chalk		4,635	2	France 4,245; Portugal 339; Germany 45.

See footnotes at end of table.

TABLE 4--Continued
SPAIN: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Sources	
			United States	Other (principal)
INDUSTRIAL MINERALS--Continued				
Clays, crude:				
Bentonite		38,940	4,001	Greece 11,870; Italy 11,035; France 7,704.
Kaolin		434,099	6,938	United Kingdom 244,312; Turkey 54,871; France 54,367.
Unspecified		48,303	3,588	France 12,499; South Africa 12,333; United Kingdom 7,682.
Diamond, natural:				
Gem, not set or strung	value, thousands	$23,205	--	Belgium-Luxembourg $17,279; Israel $2,721; India $1,480.
Industrial stones	do.	$2,270	--	Belgium-Luxembourg $1,139; Ireland $583; United Kingdom $262.
Diatomite and other infusorial earth		4,218	1,419	France 1,802; Portugal 902; Italy 70.
Feldspar		215,198	--	Turkey 133,060; France 46,811; Canada 15,098.
Fertilizer materials:				
Crude, n.e.s.		14,984	504	Israel 4,057; Italy 3,230; France 3,143.
Manufactured:				
Ammonia		610,784	--	Ukraine 223,159; Russia 70,594; United Kingdom 53,921.
Nitrogenous	tons, thousands	1,401	(2/)	Belgium-Luxembourg 251; Netherlands 206; Germany 193.
Phosphatic		129,843	39	Lebanon 44,407; Morocco 23,409; Tunisia 15,248.
Potassic		357,341	--	Israel 117,082; Jordan 95,230; Canada 72,407.
Unspecified and mixed		892,844	4,964	Belgium-Luxembourg 135,320; Poland 113,885; Norway 113,009.
Fluorspar		8,762	--	China 5,699; Mexico 2,978; France 85.
Graphite, natural		4,728	208	China 1,747; Canada 936; Germany 759.
Gypsum and plaster		27,241	2,114	Morocco 20,565; France 2,973; Portugal 916.
Lime		3,606	54	France 2,521; Portugal 426; Belgium-Luxembourg 386.
Magnesium compounds:				
Magnesite, crude		3,098	--	Turkey 1,500; Australia 686; Italy 496.
Oxides and hydroxides		82,845	5,683	China 40,307; Italy 8,238; Netherlands 7,703.
Mica:				
Crude including splittings and waste		1,880	51	India 775; France 494; Germany 218.
Worked including agglomerated splittings		184	--	India 47; Belgium-Luxembourg 31; Switzerland 31.
Nitrates, crude		8,622	--	Chile 7,556; Belgium-Luxembourg 701; Norway 251.
Phosphates, crude	tons, thousands	2,108	--	Morocco 1,779; Togo 175; Algeria 73.
Pigments, mineral, iron oxides and hydroxides, processed		15,078	91	Germany 6,805; China 3,495; France 1,693.
Precious and semiprecious stones other than diamond:				
Natural	value, thousands	$7,790	$114	Thailand $3,384; India $1,182; Brazil $943.
Synthetic	do.	$5,764	$2	Japan $1,860; Germany $1,370; France $741.
Pyrite, unroasted		149	--	Germany 77; Italy 48; Austria 24.
Quartz crystal, piezoelectric	value, thousands	$1,902	--	Japan $1,860; Italy $36; France $4.
Salt and brine		21,906	6	Israel 14,289; France 4,343; Netherlands 1,732.
Sodium compounds, n.e.s.:				
Soda ash, manufactured		133,809	94,262	Bulgaria 19,738; Turkey 6,746; Portugal 4,380.
Sulfate, manufactured		2,646	--	Germany 1,605; France 404; Belgium-Luxembourg 347.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked		532,703	5,600	Brazil 111,376; Morocco 91,607; Italy 69,437.
Worked		87,367	43	Italy 45,510; Portugal 25,374; Greece 3,288.
Dolomite, chiefly refractory-grade		5,613	3	France 2,225; Germany 1,360; Norway 789.
Gravel and crushed rock		328,548	--	Morocco 294,693; Portugal 11,915; Italy 11,646.
Limestone other than dimension		2	--	All from the Netherlands.
Quartz and quartzite		1,560	(2/)	Germany 626; India 332; France 254.
Sand other than metal-bearing		513,955	125	Morocco 381,839; France 52,744; Portugal 21,890.
Sulfur:				
Elemental:				
Crude including native and byproduct		62,222	--	France 57,737; Italy 4,272; Portugal 155.
Colloidal, precipitated, sublimed		271	(2/)	France 235; United Kingdom 21; Italy 8.

See footnotes at end of table.

TABLE 4--Continued
SPAIN: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Sources	
			United States	Other (principal)
INDUSTRIAL MINERALS--Continued				
Sulfur--Continued:				
Dioxide		4,970	--	Sweden 2,633; Italy 2,025; France 158.
Sulfuric acid		115,678	26	Italy 43,737; Portugal 19,372; Norway 11,924.
Talc, steatite, soapstone, pyrophyllite		38,162	578	France 25,739; China 6,523; Belgium-Luxembourg 1,051.
Vermiculite, perlite, chlorite		47,402	--	Greece 28,465; Turkey 10,000; South Africa 4,856.
Other:				
Crude		503,180	1,306	Andorra 469,841; Germany 9,161; Italy 5,603.
Slag and dross, not metal-bearing		136,629	--	Germany 46,047; France 38,632; Norway 17,549.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural		5,580	363	Portugal 5,155; Mexico 25; United Kingdom 25.
Carbon black		67,360	792	France 332,511; Ukraine 223,667; Portugal 110,886.
Coal:				
Anthracite		282,449	--	Netherlands 105,462; South Africa 67,815; United Kingdom 26,661.
Bituminous	tons, thousands	6,177	2,108	South Africa 1,943; Australia 885; Colombia 613.
Briquets of anthracite and bituminous coal		37	--	Russia 21; Germany 16.
Lignite including briquets		154	--	France 131; Germany 23.
Unspecified	tons, thousands	5,668	1,520	South Africa 2,796; Indonesia 1,223; Colombia 107.
Coke and semicoke		462,402	28,173	China 238,310; Poland 71,805; Russia 35,775.
Gas, natural:				
Gaseous	tons, thousands	1,080	--	Norway 890; Algeria 190.
Liquefied	do.	5,816	--	Algeria 4,151; Libya 940; United Arab Emirates 693.
Peat including briquets and litter		124,736	30	Germany 78,019; Estonia 10,941; Netherlands 10,646.
Petroleum:				
Crude	tons, thousands	51,955	163	Nigeria 9,911; Saudi Arabia 8,059; Iran 6,508.
Refinery products:				
Liquefied petroleum gas	do.	1,183	(2/)	Algeria 349; Saudi Arabia 293; United Kingdom 237.
Gasoline	do.	2,097	(2/)	Algeria 768; Italy 388; Greece 185.
Mineral jelly and wax		35,997	3,154	China 14,700; France 123,475; United Kingdom 117,472.
Kerosene and jet fuel		158,637	(2/)	Netherlands 41,367; United Kingdom 21,948; Italy 21,548.
Distillate fuel oil	tons, thousands	3,017	35	Italy 948; Russia 806; United Kingdom 583.
Lubricants		142,120	1,870	France 41,370; Italy 28,289; Portugal 15,132.
Residual fuel oil	tons, thousands	1,328	(2/)	Russia 559,185; France 192,621; Italy 116,093.
Bitumen and other residues		323,739	96,223	France 65,425; Belgium-Luxembourg 64,955; Portugal 46,251.
Bituminous mixtures		671	--	France 320; United Kingdom 156; Germany 96.
Petroleum coke	tons, thousands	2,691	2,362	Venezuela 159; United Kingdom 95; Aruba 24.

1/ Table prepared by Glenn J. Wallace.

2/ Less than 1/2 unit.

3/ May include vanadium.

4/ May include high-purity silicon.

5/ Includes dust, flakes, and powders.

6/ Reported under SITC item number as "selenium, tellurium, phosphorus, arsenic, etc."

Source: United Nations Statistical Office (microfiche).

TABLE 5
SPAIN: STRUCTURE OF THE MINERAL INDUSTRY OF 1997

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Alumina	Alumina Española S.A.	Alumina plant at San Ciprián, Lugo	1,000
Aluminum	Aluminio Español S.A.	Electrolytic plant at San Ciprián, Lugo	180
Do.	Industria Española del Aluminio, S.A. (Inespal)	Electrolytic plant at Avilés	100
Do.	do.	Electrolytic plant at La Coruña	25
Do.	Aluminío de Galicia S.A.	Electrolytic plant at Sabiñánigo	78
Do.	do.	do.	14
Coal:			
Anthracite	Antracitas Gaiztarro S.A.	Mines at Maria and Paulina	2,000
Do.	Antracitas de Gillón S.A.	Mines near Oviedo	2,000
Do.	Antracitas del Bierzo S.A.	Mines near León	1,000
Bituminous	Hulleras del Norte S.A. (Hunosa)	Various mines and plant	3,300
Do.	Hulleras Vasco Leonesa S.A.	Santa Lucia Mine, Leon	2,000
Do.	Minas de Figaredo S.A.	Mines near Oviedo	1,000
Do.	Nacional de Carbon del Sur (Encasur)	Rampa 3 and San Jose Mines, Cordoba	200
Lignite	Empresa Nacional de Electricidad (Endesa)	As Pontes Mine, and Andorra Mine, La Coroña	15,000
Barite	Minas de Baritina S.A. (Kali-Chemie of Germany, 100%)	Mine and plant in Espiel area, Córdoba	50
Cement	Approximately 36 cement companies,	54 plants, including	44,000
	of which the largest is--	5 (Asland) plants, of which the largest ones	(6,000)
	Asland S.A.	are plants at Puerto de Sagunto, Valencia,	2,000
		and at Villaluenga de la Sagra, Toledo	2,000
Copper:			
Metal	Atlantic Copper Holding S.A. (Freeport MacMoRan Inc., 65%; Ercros Group, 35%)	Refinery at Huelva	270
Do.	do.	Electrolytic refinery at Huelva	105
Do.	Industrias Reunidas de Cobre	Smelter at Asua-Bilbao	30
Do.	Electrolitico y Metales S.A.	Fire and electrolytic refinery at Asua-Bilboa	36
Ore, metal content	Atlantic Copper Holding, S.A. (Freeport MacMoRan Inc., 65%, Ercros Group, 35%)	Mines and plant at Arientero, near Santiago de Compostela, Corta Atalay open pit mine,	12
		Cerro Colorado open pit mine and Alredo underground mine, in Rio Tinot area	30
Do.	Navan Resources Ltd.	Migolas and Sotiel areas	6
Fluorspar, ore	Fluoruros S.A. (Bethelhem Steel Corp., 49%)	Plant at Caravia, near Colunga	400
Do.	do.	Opencast mines at San Lino and Val Negro and underground mine at Eduardo,near Carav--all in Asturias	350
Do.	do.	Plant at Collada, Gijón Mines at Veneros Sur and Corona, Gijón	200
Gold kilograms	Rio Narcea Gold Mines, Ltd.	Belmonte de Miranda, Asturias	3,750
Iron ore	Compañia Andaluza de Minas S.A. (Mokta, 62%)	Mine at Alquife, Granada	4,000
Do.	Altos Hornos de Vizcaya S.A. (U.S. Steel, 25%)	Nine mines in Province of Vizcaya	4,000
Do.	Compañia Minera Siderúgica de Ponferrada S.A.	Eight mines in Province of León	3,000
Do.	Minera del Andévalo S.A.	Opencast mine at Coba, Huelba	2,000
Lead:			
Metal	Sociedad Minera y Metalúrgica de Peñarroya	Smelter at Cartagena, Murcia	60
	de España, S.A. (Peñarroya, France, 98%)	Refinery at Cartagena, Murcia	60
Do.	Compañia La Cruz, Minas y Fundaciones	Smelter at Lineares, Jaén	40
	de Plomo S.A.	Refinery at Lineares, Jaén	40
Do.	Tudor S.A.	Secondary smelter at Saragoza	16
Do.	Ferroaleaciones Españolas, S.A.	Secondary smelter at Medina del Campo	12
Do	Derivados de Minerales y Metales	Secondary smelter at Barcelona	5
Ore	Sociedad Minera y Metalúrgica de Peñarroya España S.A. (Peñarroya, France 90%)	Opencast mine at Montos de Los Azules, near Unión Murcia	25
Do.	Andaluza de Piritas S.A. (APIRSA)	Opencast mine at Aznalcóllar, Sevilla	21
Do.	Exploración Minera International España S.A. (EXMINESA)	Underground mine at Rubiales, Lugo	16
Magnesite	Magnesitas de Rubián S.A.	Plants at Zubiri	100
Do.	do.	Mines and plant near Sarria, south of Lugo	220
Mercury flasks	Minas de Almadén y Arrayanes S.A., (Government, 100%)	Mine and smelter at Almadén	70,000

TABLE 5--Continued
SPAIN: STRUCTURE OF THE MINERAL INDUSTRY OF 1997

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Petroleum:				
Crude	barrels per day	Chevron S.A.	Oilfield at Casablanca	300
Refined	do.	Repsol Petróleo S.A.	Refineries at Escombreras	00,000
Do.	do.	do.	Puertollano	14.000
Do.	do.	do.	Tarragona	60.000
Do.	do.	Refineria de Petróleos del Norte S.A. (Petronor)	Refinery at Somorrostro	40.000
Do.	do.	Compañia Española de Petróleos S.A.	Refinery at Santa Cruz de Tenerife	60.000
Do.	do.	Petroleos del Mediterraneo S.A. (Petromed)	Refinery at Castellón de la Plana	20.000
Do.	do.	Compañia Iberica Refinadora de Petróleos S.A. (Petroliber)	Refinery at La Coruña	40,000
Potash, ore		Potasas de Navarra S.A.	Mines and plant near Pamplona	300
Do.		Minas de Potasas de Suria S.A.	Mines at Suria	1,000
Do.		Union Explosivos Rio Tinto S.A.	Mines at Balsareny/Sallent and Cardona	2.000
Pyrite		Compañia Española de Mines de Tharsis	Mines and plants at Tharsis and Zarza, near Seville	1.300
Do.		do.	Plant at Huelva	600
Do.		Rio Tinto Minera S.A. Union Explosivos (Rio Tinto, 75%; Rio Tinto Zinc, 25%)	Mines and plant at Rio Tinto, near Seville	900
Sepiolite		Tolsa S.A.	Mine and plant at Vicalvaro, near Toledo	100
Do.		Silicatos-Anglo-Ingleses S.A.	Mine and plant at Villecas near Madrid	200
Steel		Empresa Siderurgica S.A. (Ensidesa), (Government, 100%)	Plants at Avilés, Gijon, Mieres, and Veriñ in Oviedo	6.000
Do.		Altos Hornos de Viscaya S.A. (U.S. Steel, 20%)	Ironworks and steelworks at Sestao, Bilbao	1.500
Uranium, U3O8	metric tons	Empresa Nacional del Uranio (Enusa), (Government, 100%)	Mines and plant near Ciudad Real	500
Zinc:				
Metal		Asturiana de Zinc S.A. (Azsa)	Electrolytic zinc plant at San Juan de Nieva	200
Ore		do.	Reocin mines and plants near Torrelavega, Santander	500
Do.		Andaluza de Piritas S.A. (APIRSA)	Open pit mine at Aznalcóllar, Seville	3.500
Do.		Exploración Minera International España S.A. (EXMINESA)	Underground mine at Rubiales, Lugo	500
Do.		Sociedad Minera y Metalúrgica de Penarroya-Espana S.A.	Mines and plants at Montos de los Azules y Sierra de Lujar, San Agustin	200

THE MINERAL INDUSTRY OF

SWEDEN

By Harold R. Newman

Sweden is endowed with significant deposits of iron ore, certain base metals (copper, lead, and zinc), and several industrial minerals, including dolomite, feldspar, granite, ilmenite, kaolin, limestone, marble, quartz, and wollastonite. The country is well known for the production of high-quality steel. Sweden relied heavily on hydrocarbon imports owing to inadequate indigenous resources; as a result, the country has developed nuclear and hydroelectric power.

Overall mine production increased somewhat in 1997 compared with that of 1996. Despite the closure of Outokumpu Oyj's Viscaria Mine, the increased output at North Mining Svenska AB's Zinkgruvan Mine and Boliden Mineral AB's mines accounted for this increased base metal production. *(See table 1.)*

Because Sweden lacked a zinc smelter, most zinc ore and concentrate, one of the largest mineral exports, was shipped to Norway. The country imported most of the raw material required to operate its copper and lead smelter. *(See table 2.)*

Sweden's recycling rate for aluminum cans was high because of close cooperation among the can stock producer (Finspong), the can manufacturer (PLM Fosie), the collection companies (Returpak and PLM Fosie), and the secondary smelters (Gotthard Aluminum and Finspong). Consequently, secondary aluminum production has increased in the past few years.

After acceding to the European Union (EU) on January 1, 1995, Sweden liberalized its mineral policy to parallel EU standards. The policy, based on the Swedish Minerals Act, 1992, eliminated laws requiring foreign companies to get special permission for prospecting, annulled the State's participation in mining enterprises (so-called crown shares), and revoked all taxes and royalties, except for a 28% corporate tax, one of the lowest in Europe. Furthermore, an exploration permit holder will not receive an exploration permit until adequate financial and technical capabilities can be proven.

In 1997, the Swedish Government submitted its proposals for revised mineral legislation to keep abreast of international developments in this field. The most important anticipated changes were the introduction of the obligatory filing of data after abandonment of an area to avoid duplication of work, the reorganization of the mining inspectorate (Bergmästarämbetet) to increase its effectiveness, the shortened time delays in handling of applications, and the elimination of some elements of discretion that have remained in the handling of exploration applications. Also, more-explicit rules for environmental protection would be incorporated in the exploration permit (Engineering and Mining Journal, 1998).

Exploration interest was significant with a number of Australian, Canadian, and European mining companies applying for permits. Exploration was by a permit that was valid for a period of 3 years; extensions may be granted up to a maximum of 10 years. Exploration efforts reached new record levels in 1997. According to preliminary figures, total exploration expenditure was about $27.5 million compared with about $24 million in 1996 (Engineering and Mining Journal, 1998).

Trelleborg AB announced plans to sell a majority stake in its wholly owned subsidiary Boliden. Trelleborg was expected to sell shares representing between 51% and 56% of Boliden in an initial public offering and to list the company in Canada on the Toronto Stock Exchange. Trelleborg was engaged in mining/milling operations in Sweden, Spain, and Saudi Arabia and smelting/refining operations in Sweden and Norway. Trelleborg could receive up to $660 million from the sale (Mining Journal, 1997a).

Boliden's Aitik copper mine, near Gällivare, was one of the lowest grade and most northerly copper mines in the world and was one of Europe's largest open pit mines. The ore occurs in a shear zone that can be followed from Kiruna, Sweden, to Lake Ladoga in Russia. The gold and silver byproducts contributed substantially to the profitability of the Aitik copper mine.

Western Europe's largest gold mine, Williams Resources Inc. of Canada's open pit Bjorgdal Mine, continued production in 1997. The former owner, Terra Mining AB, was bought by Williams in 1996. A plant upgrade was completed that will allow planned production to increase to more than 3,000 kilograms. Large-scale processing was helping keep production costs down. Williams was continuing its exploration activities. The company reported that this has increased estimated proven plus probable reserves to 19.3 million metric tons (Mt) grading an average of 2.21 grams per metric ton (g/t) gold (Williams Resources Inc., 1997, William Resources announces updated reserves and exploration results, accessed February 24, 1997, at URL http://www.info-mine.com/william/February 20, 1997.htm).

Williams was also continuing exploration on the Barsele gold project. The project was reported to host estimated resources of 17.6 Mt of ore averaging 1.8 g/t gold. Mineralization occurs within a granodiorite intrusive that ranges from 50 to 200 meters (m) in width and extends for an east-west strike length of 8 kilometers (km). The ore body is considered to be potentially amenable to open pit mining methods (Northern Miner, 1997).

Luossavaara-Kiirunavaara AB (LKAB) has iron ore mines and processing plants in Kiruna and Malmberget, a pelletizing plant in Svappavaara, and harbors at Luleå and Narvik. The company operated close to full capacity in 1997.

Kiruna had the world's largest, most modern underground iron ore mine. Mining was large scale and highly automated. In 1997 about 22.8 Mt of crude ore was mined from the ore body; this equates to about 62,000 metric tons per day. The Kiirunavavaara ore body runs about 4 km from north to south, it averages 80 m in width, and extends to a depth of about 2 km at a 60-degree incline. In May 1997, the first section of a new mining system (KUJ2000) came into operation. This new main level was at a depth of 1,045 m, and mining will continue near this level until around 2018 (LKAB Kiruna, 1997, Mining in Kiruna, accessed December 1, 1997, at URL http://www.lkab.se/english/kiruna/ mining InKiruna .html).

LKAB's Malmberget operations started a major project with the construction of a new main level at 1,100 m, some 250 m below the present level of 815 m. In addition, there were projects to increase pellet production, to start production and processing of hematite ores, and to build new facilities for loading and servicing the trains that transport the products to Luleå (Mining Technology, LKAB current projects, Malmberget, accessed October 8, 1997, at URL http://www.mining-technology.com/ projects/malmberget/index.html).

Svenskt Stal AB (SSAB) was Scandinavia's leading manufacturer of commercial steel. Most production consisted of steel sheets and plates, produced mainly in three SSAB subsidiaries at Borlänge, Luleå, and Oxelösund. The SSAB Oxelosund AB complex consisted of a coking plant, blast furnaces, a steel mill, and a continuous casting line for slabs and heavy plate of up to 155 millimeters in thickness. The 2-million-metric-ton-per-year SSAB Tunnplant AB was an integrated steel company with a coking plant, blast furnaces, and continuous casting line for the manufacture of slab and heavy plate.

The Zinkgruvan Mine, the largest zinc mine in Sweden, operated by Ammeberg Mining AB, was sold by its owner, Union Minière (UM) of Belgium, to North Mining Svenska AB, a subsidiary of the Australian company, North Limited. The operation produced about 60,000 metric tons per year (t/yr) of zinc in concentrate. The company reported that it plans to increase this to 80,000 t/yr during the next 3 years (Mining Journal, 1997b).

In the industrial minerals area, extensive changes in ownership have been reported during the past 5 to 6 years. This has been an expanding sector in Sweden, and a significant number of deposits were owned or controlled by international owners.

Limestone occurs in layers of different geologic ages throughout the country. About one-half of the industrial mineral value was contributed by limestone. A significant amount of limestone production was by Kalproduktion Storugns AB, owned by Nordkalk AB, a company within the Finnish Partek OY Group. The company mined about 2.8 Mt at Storugns on the Baltic island of Gotland. About 40% of this was consumed by the metallurgical industry, and 30% ended up as burnt lime. Other uses included the chemical and sugar industries and environmental applications. About 55% of total production was exported.

Borghamnsten AB had quarries and a factory equipped to saw raw blocks of marble. The company operated a raw marble quarry at Askersund, near the Glanshamar locality. Annual quarry production is about 14,000 cubic meters (m^3), which gives about 2,000 m^3 of marble as raw blocks.

Swedish peat area covers 6.4 million hectares, which was about 15% of the country's total land area. About 865,000 hectares (ha) was considered to be suitable for commercial production. In 1996, almost 8,000 ha was in production, most of which was used for fuel; the remainder was used for agriculture. The 80% used for fuel purposes was mainly in cogeneration plants for electric power and district heating. Some local authorities and industrial enterprises used peat as fuel to produce power and heat.

Sweden had a well-developed transportation system, especially in the southern part of the country. There were 97,400 km of highway and 12,000 km of railroads. About 65% of waterborne cargo was handled by the five biggest ports, Goteborg, Helsingborg, Luleå, Stockholm, and Malmo. Truck ferries have become an important form of transportation.

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Northern Miner, 1997, Williams secures foothold in Europe: Northern Miner, v. 83, no. 19, July 7, p. 1.

Major Source of Information

Geological Survey of Sweden
Mineral Resources Information Office
Skolgatan 4
93070 Malå, Sweden

TABLE 1
SWEDEN: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
METALS						
Aluminum metal:						
Primary		82,363	83,900	94,500 r/	98,306 r/	98,377 2/
Secondary e/		19,000	33,000	23,000 r/	24,000 r/	19,000
Copper:						
Mine output, Cu content		88,909	79,384	83,600	71,700	86,600
Metal:						
Smelter:						
Primary		76,298	79,080	80,000	100,000 e/	100,000
Secondary		22,102	19,620	30,000	25,000 e/	25,000
Total		98,400	98,700	110,000	125,000 e/	125,000
Refined:						
Primary		76,300	77,300	78,000	90,000 e/	85,000
Secondary		22,486	25,750	27,100	37,000 e/	32,000
Total		98,786	103,050	105,100	127,000 e/	117,000
Gold:						
Mine output, Au content	kilograms	6,548	6,364	6,500	6,100 e/	7,000
Metal, primary 3/	do.	7,278	7,998	8,200	10,100 e/	11,000
Iron and steel:						
Iron ore concentrate and pellets:						
Gross weight	thousand tons	18,728	19,663	21,634	21,020	21,893 2/
Fe content	do.	11,901	12,587	13,880	14,714	13,912 2/
Metal:						
Pig iron and sponge iron	do.	2,850	3,040	3,020	3,255	3,060 2/
Ferroalloys:						
Ferrochromium		127,543	134,076	130,170	138,110 r/	101,842 2/
Ferrosilicon		20,400	22,000	20,000	21,287 r/	22,000
Total		147,943	156,076	150,170	159,397 r/	123,842
Steel, crude	thousand tons	4,591	4,952	4,953	4,910	5,147 2/
Semimanufactures, rolled e/	do.	4,000	4,000	4,529	4,457	4,500
Lead:						
Mine output, Pb content		111,709	112,787	137,200	136,200	146,000
Metal:						
Smelter: e/						
Primary		50,000	41,200	42,200	42,100	42,200
Secondary		37,500	42,500	42,000	42,000	44,000
Total		87,500	83,700	84,200	84,100	86,200
Refined:						
Primary		46,752	46,600	39,700	42,200 2/	34,700
Secondary		37,764	36,000	51,500	41,900 2/	51,500
Total		84,516	82,600	91,200	84,100 2/	86,200
Molybdenum, oxide, roasted, Mo content e/		4,000	4,000	4,000	4,000	3,500
Nickel, metal: e/						
Unwrought, secondary		250	250	250	100	100
Primary		500	100	--	-- 2/	--
Selenium, elemental, refined		50 e/	30	26	20	20
Silver:						
Mine output, Ag content	kilograms	255,257	276,042	268,200	272,000	280,000
Metal, primary 3/	do.	293,700	295,000	261,000	301,000	300,000
Tin, metal:						
Unwrought		30	10	--	--	--
Alloy		1,040	500	--	--	--
Zinc, mine output, Zn content		168,617	159,858	167,090	160,325	158,000
INDUSTRIAL MINERALS						
Cement, hydraulic	thousand tons	2,200	2,300	2,539	2,447	2,320 2/
Clays, kaolin e/	do.	100	100	460	460	450
Feldspar, salable, crude and ground		35,492 r/ 2/	44,250 r/ 2/	45,000 r/	45,000 r/ e/	50,000
Fertilizer, manufactured: e/						
Nitrogenous	thousand tons	450	450	450	400	400
Phosphatic	do.	10	10	10	10	10
Mixed	do.	300	300	300	300	300

See footnotes at end of table.

TABLE 1--Continued
SWEDEN: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
INDUSTRIAL MINERALS--Continued						
Lime e/	thousand tons	500	500	530 2/	540	600
Olivine e/	do.	120	100	50	--	--
Pyrite, gross weight	do.	--	--	--	--	--
Quartz and quartzite e/	do.	500	500	518	525	500
Sodium sulfate, synthetic e/	do.	100	100	100	--	--
Stone: e/						
Dimension:						
Mostly unfinished	do.	100	150	150	160	150
Granite	do.	80 2/	80	90 2/	100 2/	100
Limestone	do.	5	5	5	5	5
Slate	do.	20	20	20	20	20
Other	do.	20	20	10 2/	10 2/	10
Crushed:						
Dolomite	do.	700	700	700	600	600
Granite	do.	5,000	5,000	3,200 2/	3,500 2/	3,500
Limestone:						
For cement manufacture	do.	1,000	1,000	4,000	4,000	4,000
For lime manufacture	do.	700	700	1,000	1,000	1,000
For other construction and industrial use:	do.	1,500	1,500	1,700	2,000	1,800
Chalk	do.	30	30	50 2/	25	30
For agricultural uses	do.	350	350	450 2/	475 2/	400
For other uses	do.	100	100	1,000	1,000	1,000
Total	do.	3,680	3,680	8,200 2/	8,500	8,230
Sandstone	do.	50	50	50	100	100
Undifferentiated	do.	30,000	30,000	30,000	25,000	25,000
Other	do.	700	700	700	500	500
Sulfur, byproduct: e/						
From metallurgy	do.	125	125	125	100	100
From petroleum	do.	40	40	40	40 r/	60
Total	do.	165	165	165	140 r/	160
Talc, soapstone e/		20,000	25,000	25,000	30,000	25,000
MINERAL FUELS AND RELATED MATERIALS						
Carbon black	thousand tons	20 e/	20	--	--	--
Coal, anthracite and bituminous e/	do.	10	10	--	--	--
Coke, metallurgical	do.	1,200 e/	1,200 e/	1,147	1,145	1,200
Gas, manufactured: e/						
Coke oven gas	n cubic meters	500	500	500	500	500
Blast furnace gas	do.	4,000	4,000	4,000	3,500	3,500
Peat: e/						
Agricultural use	d cubic meters	1,200	1,100	1,052	1,084	1,100
Fuel	do.	2,400	2,600	2,624	2,278	2,400
Petroleum:						
Crude e/	-gallon barrels	10	10	--	--	--
Refinery products: e/						
Liquefied petroleum gas	do.	3,000	3,000	3,000	3,500	3,500
Naphtha	do.	500	500	300	500	500
Gasoline, motor	do.	31,500	31,500	32,000	32,500	32,500
Jet fuel	do.	2,500	2,500	2,500	2,500	2,500
Kerosene	do.	50	50	50	50	50
Distillate fuel oil	do.	81,000	81,000	80,000	75,000	75,000
Residual fuel oil	do.	28,000	28,000	28,000	25,000	25,000
Other	do.	4,000	4,000	4,000	3,000	3,000
Refinery fuel and losses	do.	10,000	10,000	10,000	5,000	5,000
Total	do.	160,550	160,550	159,850	147,050	147,050

e/ Estimated. r/ Revised.

1/ Table includes data available through June 1998.

2/ Reported figure.

3/ Includes only that recovered from indigenous ores, excluding scrap.

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TABLE 2
SWEDEN: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	Granges AB (Electrolux, 100%)	Sundsvall smelter at Kubikenborg.	98
Cement	Cementa AB (Euroc, 100%)	Plants at Degerhamn, Skovde, and Slite.	3,400
Copper:			
Ore, copper content	Boliden Mineral AB (Trelleborg AB, 100%)	Mines at Aitik, Garpenberg, Kankberg, Kristineberg, Langdal, Petiknas, and Renstrom.	68
Do.	Outokumpu Oyj	Mines at Viscaria (closed)/Pahtohavare.	22
Metal	Boliden Mineral AB (Trelleborg AB, 100%)	Smelter and refinery at Ronnskar.	100
Feldspar	Berglings Malm & Mineral AB (Omya GmbH, 100%)	Mines at Beckegruvan, Hojderna, and Limbergsbo.	50
Do.	Forshammar Mineral AB (Omya GmbH, 100%)	Mines at Limberget and Riddarhyttan.	30
Do.	Larsbo Kalk AB (Omya GmbH, 100%)	Mines at Glanshamar and Larsbo.	20
Ferroalloys	Vargon Alloys AB	Plant at Vargon.	175
Gold:			
Ore, gold content kilograms	Williams Resources Inc.	Bjorgdal Mine at Skellefta.	3,000
Do. do.	Boliden Mineral AB (Trelleborg AB, 100%)	Mines at Aitik, Akerberg, Kankberg, Kristineberg, Langdal, Petiknas, and Renstrom.	2,000
Metal	Boliden Metals AB (Trelleborg AB, 100%)	Smelter and refinery at Ronnskar.	9
Iron ore	Luossavaara-Kiirunavaara AB (Government, 98%)	Mines at Kiruna and Malmberget.	28,500
Iron and steel	Svenskt Stal AB (Government, 48%)	Steelworks at Luleå, Oxelosund, and Domnarvet.	3,500
Kyanite	Svenska Kyanite AB (Svenska Mineral, 100%)	Quarry at Halskoberg.	10
Lead:			
Ore, lead content	Boliden Mineral AB (Trelleborg AB, 100%)	Mines at Garpenberg, Laisvall, Langdal, Petiknas, and Renstrom.	110
Do.	North Mining Svenska AB	Zinkgruvan Mine at Ammeberg.	20
Metal	Boliden Metals AB (Trelleborg AB, 100%)	Smelter and refinery at Ronnskar.	115
Lime	Euroc Mineral AB	Plants at Limham, Koping, and Storugns.	250
Do.	Svenska Mineral AB	Plants at Rattvik and Boda.	250
Petroleum, refined barrels per day	Skandinaviska Raffinaderi AB	Refinery at Lysekil.	210,000
Do.	BP Raffinaderi AB	Refinery at Goteborg.	100,000
Do.	Shell Raffinaderi AB	Do.	82,000
Do.	AB Nynas Petroleum	Refineries at Goteborg, Malmo, and Nynashamn.	54,000
Silver, metal kilograms	Boliden Metals AB (Trelleborg AB, 100%)	Smelter and refinery at Ronnskar.	300,000
Do. do.	North Mining Svenska AB	Zinkgruvan Mine at Ammeberg.	25,000
Zinc, ore, zinc content	Boliden Mineral AB (Trelleborg AB, 100%)	Mines at Garpenberg, Laisvall, and Langdal.	112
Do.	North Mining Svenska AB	Zinkgruvan Mine at Ammeberg.	60

TABLE 3

SWEDEN: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

			Destinations	
Commodity		Total	United States	Other (principal)
METALS				
Akali and akaline-earth metals:				
Alkali metals	value, thousands	$51	--	Norway $24; Thailand $22; Germany $4.
Alkaline-earth metals	do.	$56	$16	Ukraine $15; Italy $14; Finland $9.
Aluminum:				
Ore and concentrate	do.	$1	--	All to Czech Republic.
Oxides and hydroxides		457	--	Norway 329; Finland 78; Czech Republic 26
Metal including alloys:				
Scrap		53,979	1,624	United Kingdom 12,401; Germany 8,778; Denmark 6,580.
Unwrought		70,664	--	Germany 29,347; United Kingdom 11,763; Netherlands 10,720.
Semimanufactures		88,045	7,310	Denmark 20,453; United Kingdom 12,062; Norway 10,471.
Antimony, metal including alloys, all forms		10	--	Finland 6; Canada 3; Norway 1.
Bismuth, metal including alloys, all forms	value, thousands	$7	--	Finland $3; Denmark $2; Norway $2.
Cadmium, metal including alloys, all forms	do.	$26	$1	Denmark $5; Japan $5; Germany $4.
Chromium:				
Ore and concentrate		13	--	All to Norway.
Oxides and hydroxides		17	--	Norway 10; Germany 3; Yugoslavia 2.
Metal including alloys, all forms		20	--	United Kingdom 11; Belgium-Luxembourg 2, Finland 2.
Cobalt:				
Ore and concentrate		2	--	All to South Africa.
Oxides and hydroxides		396	6	Norway 371; South Africa 14; Poland 4.
Metal including alloys, all forms	value, thousands	$6,017	$482	United Kingdom $1,194; Norway $1,152; Netherlands $1,057.
Columbium and tantalum, tantalum metal including alloys, all forms	do.	$146	--	Ireland $44; Germany $43; Iceland $37.
Copper:				
Ore and concentrate		42,150	--	Finland 41,929; Italy 219.
Matte and speiss including cement copper		2	--	Indonesia 1; Norway 1.
Metal including alloys:				
Scrap		17,996	225	Germany 3,659; Hong Kong 3,159; Netherlands 2,855.
Unwrought	value, thousands	$73,493	$26	United Kingdom $56,631; Finland $6,109; Norway $4,684.
Semimanufactures	do.	$502,868	$55,681	Germany $88,722; Denmark $55,601; Finland $54,530.
Germanium, metal including alloys, all forms	do.	$18	--	United Kingdom $17; China $1.
Gold:				
Waste and sweepings	do.	$13,673	$1	Germany $11,657; United Kingdom $1,080; Denmark $521.
Metal including alloys, unwrought and partly wrought	kilograms	12,724	(2/)	Switzerland 6,018; Germany 3,015; Spain 2,000
Iron and steel:				
Ore and concentrate, excluding roasted pyrite	thousand tons	15,173	48	Germany 4,231; Finland 2,346; Netherlands 1,855
Metal:				
Scrap		283,990	6	Denmark 111,964; Spain 64,995; Turkey 48,041
Pig iron, cast iron, related materials		81,192	799	Italy 38,345; Spain 26,474; Japan 6,324.
Ferroalloys:				
Ferromanganese		2,013	--	Finland 847; Italy 201; Norway 189.
Ferronickel	value, thousands	$1	--	All to Republic of Korea.
Ferrosilicomanganese		272	--	Finland 180; Lithuania 42; Italy 22.
Ferrosilicon		1,914	--	Germany 696; France 493; Italy 292.
Silicon metal 3/		7	--	Denmark 5; Germany 1.
Unspecified		1,486	496	Finland 429; Germany 128; Italy 110.
Steel, primary forms	value, thousands	$155,084	$40,534	United Kingdom $25,043; Republic of Korea $15,137; Austria $4,770

See footnotes at end of table.

TABLE 3--Continued
SWEDEN: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations United States	Destinations Other (principal)
METALS--Continued				
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	thousand tons	1,236	67	Germany 300; Denmark 194; Italy 117.
Clad, plated, coated	value, thousands	$343,703	$7,094	Denmark $57,179; Finland $31,461; Germany $29,831.
Of alloy steel		773,441	72,706	United Kingdom 263,895; Germany 107,937; Italy 51,863.
Bars, rods, angles, shapes, sections	value, thousands	$772,759	$69,797	Germany $136,014; United Kingdom $75,117; Italy $62,938.
Rails and accessories		14,311	--	Germany 5,275; Malaysia 5,013; Norway 2,351.
Wire		83,370	7,870	Germany 16,154; Finland 10,995; Denmark 8,367.
Tubes, pipes, fittings	value, thousands	$772,745	$34,778	Germany $113,716; France $67,268, Italy $61,109
Lead:				
Ore and concentrate		79,738	--	Belgium-Luxembourg 30,893; Netherlands 22,194; United Kingdom 13,913
Oxides		534	--	Norway 528; Poland 5; Denmark 1.
Metal including alloys:				
Scrap		420	--	Belgium-Luxembourg 136; United Kingdom 127; Norway 68.
Unwrought		51,892	--	United Kingdom 11,418; Germany 10,591; Italy 8,704.
Semimanufactures		839	--	Germany 281; Denmark 242; Finland 136.
Magnesium: Metal including alloys:				
Scrap		77	--	United Kingdom 56; Germany 15; Norway 6.
Unwrought		1,683	2	Germany 646; Austria 385; Finland 302.
Semimanufactures		65	--	Austria 50; Germany 4; Finland 3.
Manganese:				
Oxides and hydroxides		108	--	Norway 52; Germany 24; Czech Republic 13.
Metal including alloys, all forms		121	--	Finland 28; Germany 21; Norway 11.
Mercury	value, thousands	$26	--	Yugoslavia $20; France $4; Norway 41.
Molybdenum: Metal including alloys:				
Unwrought, including waste and scrap		17	--	Germany 16; Slovakia 1.
Semimanufactures	value, thousands	$398	$1	Ireland $101; Japan $82; Netherlands $44.
Nickel:				
Matte and speiss		5	--	All to Norway.
Metal including alloys:				
Scrap		248	4	Germany 180; Austria 38; United Kingdom 23.
Unwrought		245	2	Norway 171; United Kingdom 39; Russia 21.
Semimanufactures		3,115	1,236	Germany 390; United Kingdom 239; France 157.
Platinum-group metals:				
Waste and sweepings	value, thousands	$1,494	$3	Norway $1,341; Denmark $130; Switzerland $21.
Metal including alloys, unwrought and partly wrought	do.	$1,005	$24	Norway $386; Finland $195; Germany $173.
Silver: Metal including alloys, unwrought and partly wrought	do.	$51,776	$3	Germany $19,561; United Kingdom $12,526; Norway $11,014.
Tin:				
Ore and concentrate	do.	$2	--	All to Norway.
Metal including alloys:				
Scrap		173	--	Belgium-Luxembourg 140; Denmark 17; Germany 9.
Unwrought		207	(2/)	South Africa 89; Norway 62; Finland 22.
Semimanufactures	value, thousands	$1,015	--	Denmark $467; Norway $240; Finland $231.
Titanium:				
Oxides		113	20	Norway 33; Finland 29; Denmark 19.
Metal including alloys:				
Unwrought, including waste and scrap		577	500	United Kingdom 35; Germany 28; Norway 8.
Semimanufactures		421	52	Denmark 112; Norway 88; Finland 45.

See footnotes at end of table.

TABLE 3--Continued
SWEDEN: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations: United States	Destinations: Other (principal)
METALS--Continued				
Tungsten: Metal including alloys:				
Unwrought, including waste and scrap		31	15	Germany 11; Norway 2; Finland 1.
Semimanufactures	value, thousands	$2,833	$70	Japan $628; Israel $470; Denmark $270.
Uranium and thorium, metal including all forms:				
Uranium	do.	$587	$45	France $542.
Thorium	do.	$2,966	$298	France $1,398; Belgium-Luxembourg $1,268, Israel $2.
Zinc:				
Ore and concentrate		315,030	--	Belgium-Luxembourg 109,852; Norway 86,603, Finland 51,630.
Oxides		14	--	Estonia 4, Norway 4; Netherlands 3.
Metal including alloys:				
Scrap		6,524	64	United Kingdom 798; Germany 617; Norway 480
Unwrought		158	--	Norway 67; Netherlands 16; Italy 15.
Semimanufactures 4/	value, thousands	$1,141	$1	United Kingdom $269; Norway $219; Germany $150.
Zirconium:				
Ore and concentrate		340	--	Norway 321; Denmark 19.
Metal including alloys:				
Unwrought, including waste and scrap		7	--	All to France.
Semimanufactures		36	8	Germany 18; China 7; Netherlands 2.
Other:				
Ores and concentrates		33	--	All to Norway.
Oxides and hydroxides		453	1	United Kingdom 374; India 20; Norway 17.
Ashes and residues		63,043	7	Norway 43,756; United Kingdom 10,415; Netherlands 7,529.
Base metals including alloys, all forms		37	26	Japan 8; Austria 2; Brazil 1.
Metalloids 5/		28	--	United Kingdom 20; Norway 3; Finland 2.
Precious metals, n.e.s.:				
Ores and concentrates	value, thousands	$27,809	--	Germany $21,016; United Kingdom $6,786; Norway $7.
Waste and sweepings	do.	$7,594	$50	Norway $2,483; Germany $2,063; France $1,783
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.		226	--	Norway 96; Poland 72; Germany 41.
Artificial corundum		407	--	Norway 373; Estonia 28; Hungary 2.
Dust and powder of precious and semiprecious stones including diamonds	value, thousands	$167	--	Ireland $92; United Kingdom $36; South Africa $22.
Grinding and polishing wheels and stones	do.	$30,319	$2,114	Norway $5,292; Finland $3,534; Germany $2,945
Asbestos, crude		18	--	All to United Kingdom.
Barite and witherite		114	--	Norway 90; Poland 24.
Boron: oxides and acids		136	2	Norway 112; Japan 9; Germany 4.
Bromine, fluorine, iodine	value, thousands	$11	--	Finland $6; Norway $3; Denmark $2.
Cement	thousand tons	1,180	762	Nigeria 396; Finland 15; Norway 5.
Chalk		10,917	6	Denmark 4,615; Finland 3,615; Norway 2,485
Clays, crude:				
Bentonite		5,522	--	Finland 2,685; Norway 2,519; Germany 269
Kaolin		13,753	--	Norway 7,153; Denmark 6,531; Russia 18.
Unspecified		414	--	Finland 139; Netherlands 72; Norway 58.
Diamond, natural:				
Gem, not set or strung	value, thousands	$291	--	Russia $260; Togo $16; Norway $13.
Industrial stones	do.	$714	--	Belgium-Luxembourg $699; Argentina $6; Netherlands $6.
Diatomite and other infusorial earth		1,343	18	Russia 329; Finland 270; Lithuania 225.
Feldspar		24,731	--	United Kingdom 11,999; Germany 3,936; Italy 2,744.

See footnotes at end of table.

TABLE 3--Continued
SWEDEN: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
INDUSTRIAL MINERALS--Continued				
Fertilizer materials:				
Crude, n.e.s.		572	--	Japan 252; Norway 211; Finland 105.
Manufactured:				
Ammonia		1,145	--	Norway 1,085; Germany 49; Indonesia 5.
Nitrogenous	value, thousands	$16,386	$12	Ireland $5,519; Norway $3,894; Germany $2,753.
Phosphatic		7	--	All to Norway.
Potassic		138,168	--	Norway 26,007; Netherlands 25,393; Finland 18,596.
Unspecified and mixed		110,246	--	Denmark 93,516; Germany 16,230; Norway 284.
Fluorspar		2,320	--	Finland 1,102; Austria 761; Norway 380.
Graphite, natural		103	1	Japan 39; United Kingdom 33; Switzerland 10.
Gypsum and plaster		376	--	Norway 179; Finland 101; Denmark 75.
Lime		114,047	--	Denmark 44,895; Finland 44,042; Norway 25,078.
Magnesium compounds:				
Magnesite, crude		12	--	United Kingdom 11; Norway 1.
Oxides and hydroxides		320	--	Denmark 94; United Kingdom 73; Norway 65.
Mica:				
Crude including splittings and waste		112	--	Norway 51; Latvia 31; Hungary 18.
Worked including agglomerated splittings	value, thousands	$124	$2	Norway $83; Poland $23; Finland $10.
Nitrates, crude		44	--	Norway 37; Denmark 7.
Phosphates, crude		1,130	4	Denmark 595; Canada 470; Norway 59.
Pigments, mineral, iron oxides and hydroxides, processed		5,803	1,258	India 1,520; France 907; Hong Kong 740.
Precious and semiprecious stones other than diamond:				
Natural	value, thousands	$4,285	$111	Thailand $1,168; United Kingdom $1,020; Canada $913.
Synthetic	do.	$18,510	--	Ireland $18,491; Canada $17; Norway $1.
Salt and brine		1,774	23	Norway 1,172; Finland 239; Denmark 103.
Sodium compounds, n.e.s.:				
Soda ash, manufactured		275	--	Norway 221; Finland 20; Poland 13.
Sulfate, manufactured		28,150	6	Finland 7,929; Denmark 6,266; Germany 3,382.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked		971,690	254	Denmark 496,676; Germany 368,486; Poland 45,831.
Worked		8,236	8	Denmark 4,823; Norway 1,864; Poland 1,135.
Dolomite, chiefly refractory-grade		41,225	--	Denmark 14,798; Norway 10,003; Finland 7,611.
Gravel and crushed rock	thousand tons	3,347	(2/)	Denmark 2,031; Germany 1,094; Norway 100.
Limestone other than dimension	do.	1,213	--	Finland 968; Denmark 112; Lithuania 47.
Quartz and quartzite		196,916	--	Norway 192,178; Germany 4,456; Japan 111.
Sand other than metal-bearing		69,052	--	Norway 61,568; Denmark 3,703; Germany 1,146.
Sulfur:				
Elemental, crude including native and byproduct		568	--	Norway 494; Netherlands 63; Finland 9.
Dioxide		51,670	40	Finland 20,347; Norway 9,970; Germany 4,974.
Sulfuric acid		240,127	--	Netherlands 109,361; United Kingdom 64,540; Belgium-Luxembourg 27,077.
Talc, steatite, soapstone, pyrophyllite		23,077	7	Netherlands 13,693; Norway 6,762; United Kingdom 1,527.
Vermiculite, perlite, chlorite		110	--	Norway 109; Finland 1.
Other:				
Crude		5,056	14	Norway 4,210; Denmark 400; Finland 235.
Slag and dross, not metal-bearing		100,355	--	Finland 67,412; Norway 7,575; Denmark 7,545.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural		69	--	Norway 55; Poland 12; Finland 2.
Carbon black		18,285	--	Poland 7,380; Finland 5,684; Denmark 2,540.
Coal:				
Anthracite		27	--	Norway 21; Sri Lanka 6.
Bituminous		1,770	--	Finland 1,080; Norway 546; Egypt 82.
Briquets of anthracite and bituminous coal		57,330	--	United Kingdom 57,292; Russia 37; Norway 1.

See footnotes at end of table.

TABLE 3--Continued
SWEDEN: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS--Continued:				
Coal--Continued:				
Lignite including briquets		3,229	--	All to Norway.
Unspecified		439	--	Norway 415; Finland 21; Denmark 3.
Coke and semicoke		58,058	--	United Kingdom 17,930; Germany 15,364; Norway 14,830.
Gas, natural, liquefied		70	--	All to Norway.
Peat including briquets and litter		61,607	13	Norway 18,805; Denmark 13,049; Netherlands 12,044.
Petroleum:				
Crude	value, thousands	$1	--	All to Norway.
Refinery products:				
Liquefied petroleum gas	do.	$36,366	$608	Norway $10,554; United Kingdom $10,381; Germany $3,685.
Gasoline	thousand tons	1,878	--	Denmark 587; United Kingdom 279; Norway 25
Mineral jelly and wax		379	9	Denmark 226; Norway 56; Poland 29.
Kerosene and jet fuel		97,198	--	Norway 47,397; United Kingdom 20,203; Germany 12,958.
Lubricants	thousand tons	3,665	45	Germany 2,061; Denmark 504; Norway 247.
Residual fuel oil	do.	2,795	129	United Kingdom 916; Italy 847; Denmark 248
Bitumen and other residues		570,449	--	Norway 208,078; Finland 159,658; Denmark 98,458.
Bituminous mixtures		32,546	83	Denmark 24,712; Norway 4,865; Belgium-Luxembourg 617.
Petroleum coke		38,895	17	Finland 21,473; United Kingdom 5,972; Germany 3,589.

1/ Table prepared by Glenn J. Wallace.

2/ Less than 1/2 unit.

3/ May include high-purity silicon.

4/ Includes dust, flakes, and powders.

5/ Reported under SITC item number as "selenium, tellurium, phosphorus, arsenic, etc."

Source: United Nations Statistical Office (microfiche).

TABLE 4
SWEDEN: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Sources	
			United States	Other (principal)
METALS				
Akali and akaline-earth metals:				
Alkali metals	value, thousands	$128	$3	Austria $70; Japan $18; United Kingdom $15.
Alkaline-earth metals		50	3	Finland 19; Austria 16; France 3.
Aluminum:				
Ore and concentrate		46,890	–	Australia 26,892; Brazil 5,776; Netherlands 5,506.
Oxides and hydroxides		178,839	326	Jamaica 110,421; Ireland 61,677; Netherland 2,479.
Metal including alloys:				
Scrap		6,167	1	Germany 1,373; Finland 1,115; Denmark 1,093.
Unwrought		105,523	–	Norway 48,506; Russia 19,919; France 18,789
Semimanufactures		115,571	768	Gemany 37,961; Norway 30,087; France 15,834.
Antimony, metal including alloys, all forms		19	–	Belgium-Luxembourg 10; Netherlands 5; Germany 2.
Beryllium, metal including alloys, all forms	value, thousands	$9	$1	Germany $8.
Bismuth, metal including alloys, all forms		11	–	Belgium-Luxembourg 4; United Kingdom 4; Germany 3.
Cadmium, metal including alloys, all forms		62	2	Norway 40; Belgium-Luxembourg 10; Netherlands 5.
Chromium:				
Oxides and hydroxides		312	1	Germany 155; United Kingdom 68; Spain 31.
Metal including alloys, all forms		486	4	United Kingdom 301; France 88; Netherlands 39.
Cobalt:				
Oxides and hydroxides		7	(2/)	Germany 6; United Kingdom 1.
Metal including alloys, all forms		816	30	Finland 235; South Africa 211; Germany 133.
Columbium and tantalum, tantalum metal including alloys, all forms	value, thousands	$679	$563	Germany $66; United Kingdom $19; Russia $18.
Copper:				
Ore and concentrate		85,258	–	Chile 62,834; Netherlands 16,324; Germany 5,680.
Matte and speiss including cement copper	value, thousands	$58	$7	Finland $30; Netherlands $20.
Metal including alloys:				
Scrap		29,025	3,049	Germany 7,042; United Kingdom 3,893; Finland 3,047.
Unwrought		50,214	391	Finland 15,527; Poland 11,532; Norway 9,484.
Semimanufactures		47,142	242	Germany 9,129; Belgium-Luxembourg 8,671; France 8,653.
Germanium, metal including alloys, all forms	value, thousands	$26	–	Belgium-Luxembourg $14; Netherlands $6; Germany $5.
Gold:				
Waste and sweepings	do.	$35	$2	Norway $33.
Metal including alloys, unwrought and partly wrought	do.	$16,403	$690	Norway $4,650; Ireland $4,598; Germany $3,622.
Iron and steel:				
Ore and concentrate:				
Excluding roasted pyrite		144,669	–	Norway 143,248; Netherlands 1,247; South Africa 105.
Pyrite, roasted		5,651	–	Finland 3,690; Norway 1,949.
Metal:				
Scrap		333,059	8,148	Estonia 83,613; Russia 62,215; Denmark 46,173.
Pig iron, cast iron, related materials		50,197	2,133	Russia 15,413; Finland 4,869; Norway 4,778
Ferroalloys:				
Ferrochromium		64,878	114	Norway 26,227; Finland 21,151; Netherlands 4,736.

See footnotes at end of table.

TABLE 4--Continued
SWEDEN: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity	Total	Sources	
		United States	Other (principal)
METALS--Continued			
Iron and steel--Continued:			
Metal--Continued:			
Ferroalloys--Continued:			
Ferromanganese	24,501	--	Norway 13,933; Netherlands 4,543; France 2,850.
Ferronickel	16,657	--	Greece 11,527; New Caledonia 1,974; Dominican Republic 1,931.
Ferrosilicochromium	2,397	--	Netherlands 1,247; China 793; Zimbabwe 216
Ferrosilicomanganese	18,163	--	Belgium-Luxembourg 1,051; Poland 983; France 950.
Ferrosilicon	30,978	1	Norway 27,183; Poland 2,854; United Kingdom 375.
Silicon metal 3/	2,487	1	Norway 2,407; United Kingdom 30; Germany 14.
Unspecified	9,555	20	Netherlands 2,547; Germany 1,836; Norway 1,704.
Steel, primary forms	335,335	1,640	United Kingdom 310,277; Germany 10,173, Finland 6,947.
Semimanufactures:			
Flat-rolled products:			
Of iron or nonalloy steel:			
Not clad, plated, coated	498,744	71	Germany 123,698; Denmark 77,967; Finland 76,584.
Clad, plated, coated	556,016	278	Germany 184,145; France 105,290; Finland 64,106.
Of alloy steel	130,174	525	Germany 55,090; United Kingdom 21,490; Finland 21,415.
Bars, rods, angles, shapes, sections	590,933	1,299	Finland 159,359; United Kingdom 104,616; Germany 85,801.
Rails and accessories	22,659	--	Austria 13,277; United Kingdom 4,063; France 2,941.
Wire	56,858	73	United Kingdom 15,103; Germany 11,889; Belguim-Luxembourg 10,654.
Tubes, pipes, fittings	306,532	843	Finland 58,473; Germany 58,067; United Kingdom 36,005.
Lead:			
Ore and concentrate	1,158	--	All from Ireland.
Oxides	5,148	1	Germany 4,977; Finland 161; United Kingdom 4.
Metal including alloys:			
Scrap	11,153	--	Norway 5,323; Estonia 3,635; Denmark 1,215.
Unwrought	9,368	5	Russia 2,924; Kazakstan 2,353; Finland 2,113.
Semimanufactures	141	1	Germany 103; Switzerland 20; United Kingdom 6.
Magnesium, metal including alloys:			
Unwrought	3,325	1	Norway 2,757; Finland 362; Netherlands 145.
Semimanufactures	339	26	Norway 135; Austria 40; Netherlands 38.
Manganese:			
Ore and concentrate, metallurgical-grade	173	15	Netherlands 156; Germany 2.
Oxides and hydroxides	2,200	5	Norway 1,796; Belgium-Luxembourg 212; Germany 116.
Metal including alloys, all forms	2,299	387	Netherlands 649; China 513; Germany 340.
Mercury value, thousands	$472	$1	Germany $462; Netherlands $4; United Kingdom $3.
Molybdenum:			
Ore and concentrate:			
Roasted	5,503	2,409	Chile 1,205; Belgium-Luxembourg 872; Netherlands 703.
Unroasted	1	--	All from United Kingdom.

See footnotes at end of table.

TABLE 4--Continued
SWEDEN: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Sources	
			United States	Other (principal)
METALS--Continued				
Molybdenum--Continued:				
Metal including alloys:				
Unwrought, including waste and scrap		72	6	Germany 40; United Kingdom 25; Estonia 1.
Semimanufactures		49	16	Austia 20; Germany 10; Belgium-Luxembourg 2.
Nickel:				
Ore and concentrate	value, thousands	$1	$1	
Matte and speiss		5,442	--	All from Netherlands.
Metal including alloys:				
Scrap		24,811	7,878	Germany 6,599; Russia 6,581; Switzerland 1,775.
Unwrought		15,136	(2/)	United Kingdom 5,054; Finland 4,247; Norway 3,636.
Semimanufactures		2,103	174	United Kingdom 755; France 695; Belgium-Luxembourg 193.
Platinum-group metals:				
Waste and sweepings	value, thousands	$1	--	All from Finland.
Metal including alloys, unwrought and partly wrought	do.	$10,712	$1,582	Switzerland $4,486; Germany 43,257; United Kingdom $590.
Silver, metal including alloys, unwrought and partly wrought	do.	$14,523	$141	Norway $6,861; Germany $2,790; Spain $1,686.
Tin: Metal including alloys:				
Scrap		93	--	Denmark 57; Finland 20; Norway 15.
Unwrought		557	1	Netherlands 376; Germany 78; Belgium-Luxembourg 30.
Semimanufactures	value, thousands	$1,508	$1	United Kingdom $626; Germany $622; Netherlands $134.
Titanium:				
Ore and concentrate		658	--	Netherlands 256; Germany 186; Australia 101.
Oxides		1,614	2	Norway 618; Germany 244; Finland 209.
Metal including alloys:				
Unwrought, including waste and scrap		146	1	Russia 110; Kazakstan 20; Netherlands 5.
Semimanufactures		255	68	Japan 27; Italy 24; Norway 24.
Tungsten:				
Metal including alloys:				
Unwrought, including waste and scrap		388	146	Germany 125; United Kingdom 59; Netherlands 23.
Semimanufactures	value, thousands	$1,260	$249	Germany $578; United Kingdom $131; France $115.
Uranium and thorium, metal including all forms:				
Uranium	do.	$222	$222	
Thorium	do.	$305	$6	Canada $298.
Vanadium, metal including alloys, all forms		71	(2/)	Germany 55; Netherlands 16.
Zinc:				
Ore and concentrate		2	--	All from Germany.
Oxides		3,096	--	Germany 1,381; United Kingdom 669; Netherlands 402.
Metal including alloys:				
Scrap		266	--	Denmark 156; Norway 85; Finland 25.
Unwrought		39,616	9	Norway 16,559; Finland 13,348; Belgium-Luxembourg 1,543.
Semimanufactures 4/		2,482	2	Norway 1,838; Germany 421; United Kingdom 97.
Zirconium, ore and concentrate		788	52	Belgium-Luxembourg 336; Netherlands 288; Finland 81.
Other:				
Oxides and hydroxides		3,358	1,537	Germany 624; Russia 441; United Kingdom 248.

See footnotes at end of table.

TABLE 4--Continued
SWEDEN: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Sources	
			United States	Other (principal)
METALS--Continued				
Other--Continued:				
Ashes and residues		82,595	2,410	Germany 50,202; United Kingdom 12,145; Finland 4,437.
Base metals including alloys, all forms	value, thousands	$4,319	$40	Germany $3,190; United Kingdom $501; Belgium-Luxembourg $285.
Metalloids 5/		91	4	Germany 55; Netherlands 17; Belgium-Luxembourg 7.
Precious metals, n.e.s.:				
Ores and concentrates	value, thousands	$19,264	--	Saudi Arabia $16,798; Germany $1,349; United Kingdom $1,116.
Waste and sweepings	do.	$16,536	$14,548	Norway $1,294; Germany $218; United Kingdom $192.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural, corundum, emery, pumice, etc.		666	17	Germany 400; Iceland 55; India 43.
Artificial corundum		7,323	--	United Kingdom 3,047; Germany 1,095; Hungary 843.
Dust and powder of precious and semiprecious stones including diamonds	value, thousands	$4,924	$24	Switzerland $2,940; Germany $1,014; United Kingdom $480.
Grinding and polishing wheels and stones		2,778	18	Denmark 911; Netherlands 407; United Kingdom 353.
Asbestos, crude		158	--	All from Canada.
Barite and witherite		2,668	--	Netherlands 1,769; Germany 632; United Kingdom 257.
Boron:				
Crude natural borates		728	--	Netherlands 719; Germany 7; Denmark 2.
Oxides and acids		1,508	2	Turkey 681; france 286; Netherlands 176.
Bromine, fluorine, iodine		11	(2/)	Netherlands 8; Germany 2.
Cement		223,428	35	Lithuania 71,372; Poland 65,683; France 55,301.
Chalk		53,133	--	Denmark 47,999; Germany 1,838; Belgium-Luxembourg 1,289.
Clays, crude:				
Bentonite		110,649	1,152	Greece 83,503; United Kingdom 10,898; Cyprus 4,851.
Kaolin		342,964	106,440	United Kingdom 212,839; Netherlands 13,418; Germany 3,349.
Unspecified		31,664	13,818	China 4,810; Netherlands 2,820; Germany 2,534.
Cryolite and chiolite	value, thousands	$1	--	All from Switzerland.
Diamond, natural:				
Gem, not set or strung	do.	$4,557	$17	Belgium-Luxembourg $2,172; Israel $1,564; India $476.
Industrial stones	do.	$89	$4	Netherlands $42; Israel $20; Belgium-Luxembourg $19.
Diatomite and other infusorial earth		5,130	1,293	Denmark 2,421; Spain 681; Iceland 558.
Feldspar		10,017	--	Norway 8,930; Italy 350; Germany 101.
Fertilizer materials:				
Crude, n.e.s.		1,310	46	Denmark 1,225; United Kingdom 34; Norway 3.
Manufactured:				
Ammonia		199,996	1	Russia 105,310; Germany 37,536; Poland 36,448.
Nitrogenous		410,437	6	Norway 240,674; Russia 52,935; Lithuania 38,632.
Potassic		12,068	--	Germany 11,913; France 138; Denmark 7.
Unspecified and mixed		47,493	15	Netherlands 20,766; Poland 12,717; Denmark 5,470.

See footnotes at end of table.

TABLE 4--Continued
SWEDEN: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Sources	
			United States	Other (principal)
INDUSTRIAL MINERALS--Continued				
Fluorspar		16,082	--	China 5,007; Netherlands 4,884; Germany 2,314.
Graphite, natural		496	2	Germany 325; Norway 46; Brazil 38.
Gypsum and plaster		322,453	80	Denmark 189,418; Spain 101,155; Germany 27,411.
Lime		51,317	--	France 32,261; Norway 5,061, Poland 4,265
Magnesium compounds:				
Magnesite, crude		145	--	Norway 56; Germany 36; Slovakia 24.
Oxides and hydroxides		32,622	398	Greece 9,100; Germany 6,131; Spain 5,996.
Mica:				
Crude including splittings and waste		723	1	United Kingdom 341; Finland 157; France 132.
Worked including agglomerated splittings		190	1	Austria 80; Germany 45; Switzerland 38.
Nitrates, crude		4,933	--	Belgium-Luxembourg 3,002; Germany 1,497; Poland 334.
Phosphates, crude		61,024	4	Morocco 60,954; France 61; Germany 3.
Pigments, mineral, iron oxides and hydroxides, processed		6,103	2	Norway 2,951; Germany 1,844; United Kingdom 841.
Potassium salts, crude		25	--	All from Germany.
Precious and semiprecious stones other than diamond:				
Natural	value, thousands	$5,240	$728	Sri Lanka $1,472; Thailand $774, Hong Kong $437.
Synthetic	do.	$1,485	$22	Ireland $818; Germany $272; Japan $143.
Pyrite, unroasted		293	--	Italy 198; Finland 81; Germany 13.
Quartz crystal, piezoelectric	value, thousands	$181	$4	Japan $121; Denmark $21; Italy $9.
Salt and brine	thousand tons	1,096	(2/)	Germany 552; Netherlands 230; Denmark 158.
Sodium compounds, n.e.s.:				
Soda ash, manufactured		93,835	70	Poland 43,295; Germany 25,585; Netherlands 23,956.
Sulfate, manufactured		4,671	--	Finland 1,917; Netherlands 1,763; Denmark 331.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked		5,246	15	Norway 2,064; Finland 1,782; Israel 574.
Worked		30,285	239	Portugal 15,198; Norway 5,291; Denmark 2,872.
Dolomite, chiefly refractory-grade		214,172	4	Norway 82,200; United Kingdom 68,278; Belgium-Luxembourg 56,643.
Gravel and crushed rock		365,649	63	Norway 257,782; Belgium-Luxembourg 51,981; Finland 31,161.
Limestone other than dimension		55,440	--	Norway 20,265; Denmark 17,618; Latvia 9,195.
Quartz and quartzite		1,504	139	Belgium-Luxembourg 1,092; Denmark 170; Brazil 21.
Sand other than metal-bearing		597,959	1,116	Denmark 418,824; Norway 16,789; Belgium-Luxembourg 154,474.
Sulfur:				
Elemental:				
Crude including native and byproduct		90,214	61	Poland 88,069; Denmark 1,136; United Kingdom 655.
Colloidal, precipitated, sublimed		1,074	--	Norway 754; Germany 293; United Kingdom 22.
Sulfuric acid		312	1	Germany 155; United Kingdom 68; Spain 31.
Talc, steatite, soapstone, pyrophyllite		24,718	1	Finland 17,093; Norway 3,647; Belgium-Luxembourg 1,771.
Vermiculite, perlite, chlorite		1,680	63	United Kingdom 682; Netherlands 601; Norway 154.

See footnotes at end of table.

TABLE 4--Continued
SWEDEN: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity	Total	Sources: United States	Sources: Other (principal)
INDUSTRIAL MINERALS--Continued			
Other:			
Crude	226,213	259	Norway 212,333; Germany 6,222; Estonia 3,002.
Slag and dross, not metal-bearing	37,311	316	Norway 25,252; Netherlands 5,188; United Kingdom 3,117.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,304	20	Norway 1,109; Finland 145; France 24.
Carbon black	12,747	69	Netherlands 7,760; Germany 2,215; France 1,077.
Coal:			
Anthracite	95,962	50,836	China 16,070; Belgium-Luxembourg 11,971, United Kingdom 8,300.
Bituminous thousand tons	2,837	835	Poland 1,010; Australia 472; Russia 242.
Briquets of anthracite and bituminous coal	10,319	79	Poland 10,218; Sri Lanka 15; Denmark 7.
Lignite including briquets	13,787	--	Australia 13,680; Germany 107.
Unspecified	303,132	43,449	Poland 142,939; Australia 41,276; Venezuela 35,065.
Coke and semicoke	366,089	10,815	China 131,137; United Kingdom 64,010; Japan 40,000.
Gas, natural: Liquefied	707,339	--	Denmark 707,315; Poland 24.
Peat including briquets and litter	155,580	--	Estonia 99,448; United Kingdom 28,481; Finland 23,687.
Petroleum:			
Crude thousand tons	21,342	--	Norway 10,159; United Kingdom 2,480; Denmark 1,884.
Refinery products:			
Liquefied petroleum gas	713,524	(2/)	Norway 523,175; United Kingdom 103,100; Algeria 32,086.
Gasoline thousand tons	1,593	(2/)	Denmark 705; Finland 638; United Kingdom 112.
Mineral jelly and wax	17,534	419	Germany 8,432; Norway 5,133; Belgium-Luxembourg 690.
Kerosene and jet fuel	965,042	62	Finland 320,171; Denmark 263,094; Germany 126,944.
Lubricants thousand tons	1,436	2	Estonia 425; Finland 415; Denmark 190.
Residual fuel oil tons, thousands	1,829	(2/)	Germany 987; Indonesia 248; United Kingdom 130.
Bitumen and other residues	4,603	25	France 2,490; Finland 1,060; United Kingdom 995.
Bituminous mixtures	5,777	30	France 3,076; Germany 1,605; Denmark 497.
Petroleum coke	99,166	41,015	United Kingdom 21,817; Denmark 14,110; Netherlands 12,374.

1/ Table prepared by Glenn J. Wallace.

2/ Less than 1/2 unit.

3/ May include high-purity silicon.

4/ Includes dust, flakes, and powders.

5/ Reported under SITC item number as "selenium, tellurium, phosphorus, arsenic, etc."

Source: United Nations Statistical Office (microfiche).

THE MINERAL INDUSTRY OF

SWITZERLAND

By Harold R. Newman

The country was an important producer of aluminum. Other mineral production was limited to commodities required for construction, including cement, clays, gravel, gypsum, lime, and sand. *(See table 1.)* The mineral industry was largely controlled by the Government and was owned either privately or by regional cantons. *(See table 2.)* Switzerland relied on imports for many mineral commodities, owing to self-imposed environmental restrictions and lack of natural resources. The country was a large diamond center with a turnover of more than $1 billion. For more extensive coverage of the mineral industry of Switzerland, see the 1996 Minerals Yearbook, Volume III, International Review of Europe and Central Eurasia.

TABLE 1
SWITZERLAND: PRODUCTION OF MINERAL COMMODITIES 1/

(Thousand metric tons unless otherwise specified)

Commodity 2/		1993	1994	1995	1996	1997 e/
METALS						
Aluminum:						
Primary	metric tons	36,439	24,172	20,726 r/	26,592 r/	27,000
Secondary	do.	4,200	6,200 r/	10,700 r/	6,000 r/ e/	6,000
Iron and steel:						
Pig iron		110	110	100 e/	100 e/	100
Electric-furnace ferroalloys e/		5	-- r/	-- r/	-- r/	--
Steel, crude		1,260	800	1,000	1,000	1,000
Semimanufactures, rolled products e/		1,000	700	700	700	700
Lead, refined, secondary	metric tons	6,000	6,350	6,400 e/	6,200 e/	6,000
INDUSTRIAL MINERALS						
Cement, hydraulic e/		4,000	4,000	4,000	3,800	3,800
Gypsum		299	298	300 e/	300 e/	300
Lime e/		40	40	35 r/	35	35
Nitrogen, N content of ammonia e/		28 3/	30	30	30	30
Salt e/		221	259	300	300	300
Sulfur, from petroleum refining e/	metric tons	3,000	3,000	3,000	4,000	5,000
MINERAL FUELS AND RELATED MATERIALS						
Petroleum refinery products: e/						
Liquefied petroleum gas	thousand 42-gallon barrels	2,000	2,000	2,000	2,000	2,000
Gasoline	do.	8,500	8,500	9,000	9,000	9,000
Jet fuel	do.	2,000	2,000	2,000	2,000	2,000
Distillate fuel oil	do.	9,500	9,500	10,000	9,500	9,500
Residual fuel oil	do.	5,500	5,500	6,000	5,500	5,500
Bitumen	do.	800	800	800	800	800
Refinery fuel and losses	do.	2,200	2,200	2,000	2,000	2,000
Total 4/	do.	30,500	30,500	31,800	30,800	30,800

e/ Estimated. r/ Revised.

1/ Table includes data available through March 1998.

2/ In addition to the commodities listed, a variety of crude construction materials (common clay, sand and gravel, and stone) were produced, but output was not reported, and available general information was inadequate to make reliable estimates of output levels.

3/ Reported figure.

4/ Total of listed products only.

TABLE 2
SWITZERLAND: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	Alusuisse-Lonza Holding AG	Smelter at Stag	48
Cement	Bundr Cementwerke AG (Holderbank Management and Consulting Ltd. 100%)	Plant at Untervaz	700
Do.	Cementfabrik Holderbank AG	Plant at Rekingen	700
Lead, secondary	Metallum AG	Smelter at Pratteln	13
Refinery, petroleum billion barrels per day	Reffinerie du Sud-Ouest SA (Compagnie Francaise des Petroles 49%, and British Petroleum 49% are major share holders.)	Refinery at Collombey	40,000
Do .	Reffinerie de Cressier SA (Kninklijke Nederlandsche Petroleum Maatschappij NV 100%)	Refinery at Cressier	36,000
Salt	Zentralbureu des Vereins der Schweizerischen Rheinsalinen (Government 100%)	Saline at Schweizerhalle	350
Do .	La Societe des Mines (Canton of Vaud 100%)	Saline at Bex	50
Steel	Monteforno Acciaierie e Laminatoi SA (Von Roll Group 93.6%)	Plant at Bodio	380
Do .	Von Roll Group	Plant at Gerlafingen	370
Do .	Von Moss Sthal AG	Plant at Emmenbrucke	300

THE MINERAL INDUSTRY OF

TAJIKISTAN

By Richard M. Levine and Walter G. Steblez

Tajikistan continued to be a substantial regional producer of primary aluminum, although its entire alumina supply must be imported. The country also mined a number of metals, including antimony, bismuth, copper, gold, lead, mercury, molybdenum, silver, tungsten, and zinc; a variety of industrial minerals; and mineral fuels, including coal, natural gas, petroleum, and uranium.

In mid-1992, a civil war began with some of the most intense fighting in 1992-93. Peace negotiations between the factions, begun in 1994, resulted in a peace agreement finalized on June 27, 1997, in Moscow. Need for rapid reconstruction of damaged infrastructure resulting from this conflict is great (World Bank for Reconstruction and Development, 1998).

According to the Interstate Committee of the Commonwealth of Independent States (CIS), the gross domestic product of Tajikistan rose by 1.7% in 1997, compared with that of 1996. Industrial production, however, declined by 2.5% during the same period. The country's output of electric power in 1997 declined by 6% compared with that of 1996; this had a negative impact on such energy-intensive industries as primary aluminum smelting (Interfax International Ltd., 1998a).

Government efforts to promote the denationalization of Tajikistan's economy involved mainly the retail and service sectors. By the beginning of 1997, 2,300 enterprises had been privatized, of which 80% were in catering, general services, and retail sectors. Reportedly, only 3% to 4% privatized enterprises were in the industrial and construction sectors (Interfax International Ltd., 1998d).

The Government of Tajikistan promulgated an official reform program for the 1995-2000 period. A major provision of this program called for creating legislation to protect foreign investors. Legislation passed in 1997 reportedly attempted to improve conditions for foreign investment (U.S. Department of Commerce, 1998c).

The Government remained the main source of investment capital, accounting for about 88% of total investment during the 10-month period from January though October 1997. During the 1991-97 period, $186 million in foreign investment was made in the economy of Tajikistan. Direct foreign investment, by year amounted to $52 million in 1991, $2.6 million in 1992, $0.5 million in 1993, $10.9 million in 1994, $36 million in 1995, $49 million in 1996, and $35 million in 1997. The United Kingdom and Canada ranked first and second, respectively, among foreign investors, with the chief activities of both countries being gold exploration and development (U.S. Department of Commerce, 1998c). Projects that the Government considered to be of high priority for foreign investment included constructing plants to process bentonite and bitumen, developing stone quarrying operations, and constructing hydroelectric powerplants.

Tajikistan's mineral industry registered increases and decreases in production during 1997, with the country's major mineral product, primary aluminum, increasing by 3.3% compared with 206,400 metric tons (t) in 1996. Coal production totaled 14,000 t; petroleum and gas condensate production, 26,000 t; and natural gas production, 42 million cubic meters, which, respectively, resulted in a decline of 28%, an increase of 1.6%, and decline of 12%, compared with output levels in 1996. Cement production amounted to 34,800 t, a decline of 29% compared with that of 1996. The production of mineral fertilizers declined by 11% to 9,800 t calculated in terms of nutrient content. However, the production of gold (2.55 t) and steel (80 t) rose from a low base of output in 1996, and increased by 76% and 40%, respectively, in 1997.

Tajikistan's total exports for 1997 were valued at $785 million, of which $311 million was exported to fellow member countries of the CIS. Total imports were valued at $797 million, of which $502 million was imported from the CIS. Aluminum continued to be a major export item, accounting for about 33% of the total value of exports; in 1996, Tajikistan's total exports of aluminum, in terms of volume, had amounted to 191,000 t (Interfax International Ltd., 1997a). In 1997, exports of electric power and precious and semiprecious stones accounted for 24% and 4%, respectively, of the total value of exports. Major imports in 1997 included alumina, petroleum refinery products (from Russia and Turkmenistan), and natural gas (from Uzbekistan) (U.S. Department of Commerce, 1998b).

The Tajik aluminum plant in Tursunzade in the southwestern part of the country had the capacity to produce about 520,000 metric tons per year (t/yr) of primary aluminum; it has been rated among the largest producers of primary aluminum in the former Soviet Union (FSU). Although fighting had been reported within several kilometers of the facility, the aluminum smelter reportedly was not seriously affected (Interfax International Ltd., 1997c). The Tadaz facility was under the protection of the CIS peacekeeping forces. Practically the entire output of aluminum at Tadaz was exported; a small amount of metal (about 5,000 t/yr) was consumed domestically to produce consumer durables. Tadaz also was a major regional employer, employing 12,000 persons directly and supporting a community of about 100,000 persons indirectly. Major importers of Tajikistan's aluminum in 1996 included Belgium, Finland, Hungary, the Netherlands, the Republic of Korea, Turkey, and the United Kingdom. In 1996, the principal CIS importers were Russia and Turkmenistan (U.S. Department of Commerce, 1998a).

Tadaz was a major consumer of the country's electric power production, consuming about 40% of total production. After the

Russian Federation, however, Tajikistan has the second largest hydroelectric power resources among the countries of the FSU. Hydroelectric power accounted for about 75% of total energy produced by the country and was also exported to neighboring countries (U.S. Department of Commerce, 1998a).

Tadaz was included in the Government's privatization effort in 1997. According to this plan, the Government was to retain a controlling interest in the enterprise's stock and would offer the remainder of the shares for sale. Tadaz's outstanding debts of about $120 million, however, were one of the obstacles to foreign investment in the venture.

Antimony and mercury concentrates were produced at the Anzob mining and beneficiation complex. In 1997, output of antimony concentrate (30% Sb) was projected to be 7,000 t, or 500 t more than that produced in 1996, but far below the complex's capacity. Ore mined at the Dzhizhikrutskoye antimony and mercury deposit was the principal feedstock for Anzob. The antimony concentrates were exported for further processing to the Kadamzhay antimony plant in Kyrgyzstan, the FSU's major producer of antimony metal and compounds. Tajikistan planned to produce antimony domestically at the Isfara hydrometallurgical plant; which was expanded to produce 500 t/yr of antimony metal. Despite the commissioning of antimony production facilities in 1996, financial constraints and transportation problems idled production during 1997. Isfara's output of antimony during its first year of production was to have ranged from 250 to 300 t. Nevertheless, the Government planned to continue efforts to initiate antimony metal production at Isfara (Interfax International Ltd., 1997d).

Gold production was an important part of Tajikistan's economy and mineral industry. The gold and silver deposits are mainly in the Zeravshan Valley in the northwestern part of the country. Only a few of the country's 30 known gold deposits, however, have been explored in detail.

In 1997, total production of gold reached 2.55 t compared with 1.45 t in 1996. According to Tajikistan's State Committee for Precious Metals, the Zeravshan Gold Co. (ZGC), a joint venture, produced 2.44 t of gold in 1997 (Interfax International Ltd., 1998e), compared with 1.25 t of gold in 1996. Investors in ZGC, apart from the Tajik Government, included Nelson Gold Corp. Ltd. of Canada with 44% of the shares of stock and the International Finance Corp. with 5% of the shares (Interfax International Ltd., 1998c).

ZGC was created in mid-1995 as a joint venture between Commonwealth Minerals Ltd. of the United Kingdom, a wholly owned subsidiary of Nelson Gold, and the Government of Tajikistan. ZGC took control of the former Soviet gold mining effort in the Pedjikent region of the Zeravshan Valley. The operation mined the Jilau deposit and planned to restart mining at the Taror deposit. The Jilau deposit was an open pit operation with ore reportedly grading 3 grams per metric ton (g/t) gold. Deeper, higher grade ore at this deposit (reportedly up to 10 g/t gold) was expected to be mined by underground methods. The Taror deposit had been developed by underground mining. Reserves at Taror was estimated to be about 3 million ounces (about 93 t) of gold. Gold from Taror will require more-complex processing than that from Jilau. The beneficiation plant, originally designed during the Soviet period to handle Taror ore, was subsequently modified to accept Jilau material. Planned upgrading at the plant would allow treatment of ore from Jilau and Taror at a rate 5,000 metric tons per day of ore (U.S. Trade Development Agency, 1998, p. II-Tj-1—II-Tj-8).

The Darvaz joint venture, in the Hatlon region of Eastern Tajikistan, involving Gold & Mineral Excavation Co. of the United Kingdom (49% of stock) and the Government of Tajikistan, produced 110 kilograms (kg) of gold in 1997, a decline of about 47%, or 100 kg, compared with that of 1996. The Darvaz mine, the second largest gold mine in Tajikistan, has resources reportedly amounting to 25 t of gold. Operational problems arose following damage to the placer mining operation that took place during hostilities in the area in December 1996. Mills and the living quarters at the facility were damaged as result of the hostilities. According to company spokespersons, restarting operations was planned for March 1997 (Interfax International Ltd., 1998b).

The Aprelevka joint venture (Gulf International Minerals of Canada 49%, and the Government of Tajikistan) initially had planned to produce 200 kg of gold during the year (Interfax International Ltd., 1998c). The purpose of the joint venture agreement, concluded in 1993, was to develop deposits in the Karamzar district, including the Aprelevka deposit, which reportedly hosts about 650,000 ounces (about 20 t) of proven gold resources. The Aprelevka deposit was mined by open pit method from 1986 to the early 1990's, when operations were discontinued because of financial constraints (Interfax International Ltd., 1997e). Gulf also conducted further exploration of the Burgunda and the Ikkizhilon deposits, which together were estimated to contain 553,300 ounces (about 17 t) of gold, as well as resources of copper and silver. Production at the Burgunda and the Ikkizhilon deposits was planned for mid-1999 (Gulf International Minerals Ltd., 1998).

Additional development in the gold sector in 1997 included the signing of a commercial agreement between the Oxus Resources Corporation of the United Kingdom and the State Committee for Geology and Mineral Resource of Tajikistan. The agreement called for geologic study of the Chulboy gold deposit in the Aini district, with estimated reserves of more than 16 t of gold, and the Tabaspin deposit in the Matcha district in the northern part of the country (Interfax International Ltd., 1997b).

Tajikistan possesses large deposits of silver with total resources reportedly of more than 60,000 t. The Adrasman mining and beneficiation complex in the Leninabad region mines and processes about 12,000 t/yr of ore from the Bolshoy Kanimansur deposit, which reportedly hosts silver resources estimated to be about 38,000 t (U.S. Department of Commerce, 1998a).

Tajikistan reportedly potentially could supply more of its needs from its own gas and oil resources. The country's fields reportedly contain reserves of more than 1 trillion cubic meters of gas and 430 million metric tons of oil. More than 80 % of the reserves are located in the south of the country. During the Soviet period, Tajikistan produced up to 200,000 t/yr of oil and 200 million cubic meters per year of gas. Since the breakup of the Soviet Union, production has fallen precipitously, and Tajikistan is more import reliant.

Tajikistan is well endowed with a number of mineral resources, including antimony, gold, silver, and uranium. Mineral development as well as economic development, however, has been seriously hampered by the instability caused by the civil war. Despite the problems of recent civil warfare and the concomitant issues of economic and political stability, Tajikistan has succeeded in attracting investment in its gold mining industry. Also, the country retains a large aluminum producing industry, which is trading with and being supplied by western firms. Investment in these mineral industries and the development of other mineral industries could provide for increased revenues from Tajikistan's mineral sector. However, Tajikistan's distant location from world markets and major transport arteries will result in transport and infrastructure development costs being factors affecting the viability of mineral development.

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TABLE 1
TAJIKISTAN: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity e/
Aluminum	Tajik aluminum plant	Tursunzade	500,000.
Antimony	Anzob mining and beneficiation complex	Dzhizhikrutskoye deposit	2,000.
Do.	Isfara hydrometallurgical plant	Isfara	500.
Bismuth	Leninabad mining and beneficiation complex	Yuzhno-Yangikanskiy deposit	25.
Do.	Isfara hydrometallurgical plant	Isfara	500.
Coal			300,000 total.
Do.	Shurabskoye brown coal	Shurab region	NA.
Do.	Fan-Yagnobskoye hard coal, deposits	Pyandzh region	NA.
Copper	Leninabad mining and beneficiation complex	Yuzhno-Yangikanskiy deposit	NA.
Gold	Tajikzoloto mining-beneficiation complex, Pamir Artel	Darvazy, Rankul placer deposits, placers in central and southern part of country	5
Do.	Zeravshan Gold Company (ZGC)	Jilau and Taror deposits	2.5
Do.	Darvaz joint venture (JV)	Yakh-Su field	2.
Do.	Aprelevka joint venture (JV)	Aprelevka deposit	0.2.
Do.	Vostokredmet refinery	Chkalovsk	NA.
Lead	Leninabad mining and metallurgical complex	Yuzhno-Yangikanskiy deposit	2,500.
Mercury	Anzob mining and beneficiation complex	Dzhizhikrutskoye deposit	150.
Molybdenum	Leinabad mining and beneficiation complex	Yuzhno-Yangikanskiy deposit	NA.
Petroleum and natural gas			200,000 (petroleum) total. 200,000,000 cubic meters (natural gas) total.
Do.	16 oil-gas deposits under exploration, including: Ravatskoye, Ayritanskoye, Madaniyatskoye	Fergana depression	NA.
Do.	Shaambary Beshtentyakskoye, Uzunkhorskoye, Kichik-Belskoye	Southern Tajik depression	NA.
Silver	Adrasman mining and beneficiation complex	Bolshoy Kanimansur deposit	NA
Vanadium pentoxide	Vostokredmet plant	Chkalovsk	350,000.
Uranium	Adrasman, Maylisu, Taboshar, Usugai deposits	Northern Tajikistan	NA.
Do.	Vostokredmet processing plant	Chkalovsk	NA.
Zinc	Leninabad mining and beneficiation complex	Yuzho-Yangikanskiy deposit	NA.

e/ Estimated. NA Not available.

THE MINERAL INDUSTRY OF

TURKMENISTAN

By Richard M. Levine

Turkmenistan, occupying an area of 488,100 square kilometers (an area slightly larger than the State of California), is the fourth largest country in land mass to form from the former Soviet Union (FSU). The territory of Turkmenistan is divided into five administrative velayats (regions)—the Akhalekyi, Balkansky, Dashkhovuaky, Lebapsky, and Maryisky. Although Turkmenistan is large in area, the Kara Kum desert covers 90% of the country. The country's 4.5 million inhabitants make it the fourth smallest, in terms of population, of the countries of the FSU.

Turkmenistan has substantial energy resources, including natural gas and oil. It had ranked among the world's leading gas producers and had been the second largest natural gas producer in the FSU after Russia. By 1977, however, Turkmenistan had fallen to fourth place in natural gas production in the FSU following Russia, Uzbekistan, and Ukraine as the country's gas production had fallen by about 80% compared with that of 1991. The country also has a wide variety of industrial mineral resources, including bromine, iodine, potash, salt, sodium sulfate, and sulfur. Following is a list of the major industrial mineral producing enterprises.

List of Industrial Mineral Enterprises

A. Enterprises Subordinate to the Turkmenistan Ministry of Energy and Industry

1. The Industrial Association Turkmenmineral

The industrial association Turkmenmineral is located in the city of Gowurdak in the Lebep velayat. The enterprise was established n 1934. The Gourdak sulfur enterprise was formed on the basis of the Gowurdak sulfur deposit. It employed about 5,000 persons.

Turkmenmineral had the following production capacity:

Lumpy sulfur—300 thousand metric tons (t)
Ground sulfur—40,000 t
Gypsum—300,000 t
Wall stone—25,000 t
Construction material—130,000 t
Salt—25,000 t
Limestone—10,000 t
Limestone flour—10,000 tons

2. Maryazot Association

The association is located 12 kilometers (km) from Mary. It omprised the Turkmen plant of nitrogenous fertilizers and the Turkmencarbamide plant. The number of personnel was 2,400. The enterprise used natural gas from the Shatlyk deposit.

The Maryazot Association had the following production capacities:

Ammonium nitrate—450,000 t
Ammonia—400,000 t
Nitric acid—360,000 t
Carbonic acid: liquid—3,000 t; solid—1,500 t
Carbamide—400,000 t
Defoliant—12,000 t

3. Nebitdag plant

The plant is located in the Vyshka settlement, 26 km southwest from the city Nebitdag in the Balkan velayat; the plant was commissioned in 1969. The number of personnel employed was 335. Nebitdag utilized raw materials from the Monjoukley deposit.

The Nebitdag plant's production capacities included:

Iodine—255 t
Ferrous bromine—3,200 t

4. Cheleken Chemical Plant

The plant is located 2 km north of the city of Cheleken in the Balkan velayat.

The Cheleken plant's production capacities included:

Iodine—335 t
Ferrous bromine—6,400 t
Iodine potassium—60 t
Iodate potassium—45 t
Iodineform—60 t
Sodium hipochloride—100 t

5. Gouvloudyz complex

The complex is located in the Gouvly-Mayak settlement in the Turkmenbashi etrap of the Balkan velayat. The complex was established in 1965, on the basis of a mine in operation since 1895. The complex employed 470 people. The Kououlyu deposit provided the raw material. The complex had the capacity to produce 680,000 metric tons per year (t/yr) of coarse salt and

160,000 t/yr of common salt.

6. Karabogazsulfate Association

The Association, established in 1929, is located in the Bekdash settlement of the Balkan velayat. It employed 2,013 personnel. The association used the buried intercrystalline brines of the Garabogassulfate bay as raw material.
Karabogazsulfate's production capacities included:

Sodium sulfate—400,000 t
Bischofite—100,000 t
Epsomite—35 ,000 t
Glauber's salt—10,000 t
Common salt—20,000 t

B. Enterprise Subordinate to the Ministry of the Construction Materials Industry

1. Byuzmein cement plant

The plant, established in 1950, is located in the city of Byuzmein in the Akhal velayat and employed 787 personnel. The cement plant used local raw materials, such as pebbles and loamy soils of the Byuzmein deposit and argyllites and gypsum of the Yagman and Gaourdak deposits. The plant had the capacity to produce about 1 million metric tons per year of portland cement, as well as certain construction materials.

C. Enterprise Subordinate to the Ministry of the Oil and Gas Industry and of Mineral Resources

1. Oglanly mine

The mine, located in the Oglanly settlement 37 km from Jebel in Balkan Velayat, was built in 1934. Industrial exploration began in 1936. It employed 94 people. The mine had the capacity to produce about 100,000 t/yr of bentonite, which was exported to Russia, Kazakstan, Ukraine, Uzbekistan, and Belarus.

Source: Embassy of Turkmenistan, Processing Enterprises. (Accessed at http:mh102.infi.net/embassy/)

In 1997, industrial production fell by 29.2% compared with that of 1996, mainly because of the fall in natural gas production that took place when Turkmenistan decided to stop shipping gas to countries of the Commonwealth of Independent States (CIS) that were far behind in their payments. Industrial output comprised 53% of the gross domestic product in 1997, and the fuel and energy sector accounted for about 50% of industrial production. Output of natural gas fell by 51%, compared with that of 1996, to 17.3 billion cubic meters. Output of oil, however, increased by 9% to 4.7 million metric tons (Mt) (Interfax Statistical Report, 1998). In the industrial minerals sector, output of bentonite, cement, iodine, lime, sodium sulfate and sulfur increased compared with that of 1996. Production of bischofite, bromine, gypsum, nitrogenous fertilizers, and salt, however, decreased compared with that of 1996. (See table 1.)

Turkmenistan's main exports were cotton fiber, natural gas, and petroleum refinery products, which accounted for 84.6% of all exports. The country exported 6.5 billion cubic meters of natural gas in 1997, which was a 70% decrease compared with 1996 exports (Interfax Statistical Report, 1998). In March, Turkmenistan stopped gas deliveries to Ukraine and the Caucasus countries because of rising debts (Interfax Petroleum Report, 1997). Exports of oil and refinery products rose by 27% owing to an increase in oil extraction and refinery output. The largest increase in exports was for crude oil, which rose to 329,99 metric tons (t) in 1997 from 193,000 t in 1996. While in 1996 crude oil was exported to Iran, Liberia, and Switzerland, in 1997, Turkmenistan also began shipping crude oil to Azerbaijan, Romania, Russia, and the United Kingdom. Exports of petroleum refinery products increased to 2.458 Mt compared with 1,980 Mt in 1996. The largest importer of refinery products from Turkmenistan was Iran, which bought about 1,396 Mt followed by Russia with 235,700 t, Austria with 158,900 t, and Azerbaijan with 127,000 t. Turkmenistan, however, was also an importer of refinery products. Imports fell to 53,100 t in 1997 from 71,500 t in 1996 (Interfax Statistical Report, 1998).

According to information from the U.S. Embassy in Ashgabat reported by the Business Information Service for the Newly Independent States (Bisnis) at the U.S. Department of Commerce, Turkmenistan is seeking investors for a number of industrial minerals production projects proposed by Turkmenistan's Ministry of Energy and Industry, which Turkmenistan believes, along with energy, have the potential to generate significant revenue for the country (U.S. Department of Commerce, July 29, 1997, IMI— Turkmenistan—List of investment projects in the chemical industry, Accessed June 4, 1998, at URL http://www.itaiep.doc.gov/bisnis/cables/970730t2.htm)

Investors were being sought to upgrade the Nebitdag iodine and bromine production plant in the village of Vyshka 30 km from Nebitdag. The reported concentration of bromine in the water i 412 grams per cubic meter (g/m^3), and the iodine concentration is 33 g/m^3. The current production capacity of the plant is 3,00 metric tons per year (t/yr) of ferrous bromide and 300 t/yr of iodine.

Investors also were being sought for a number of new iodine and bromine production projects. These included the Boyadag iodine and bromine plant at the Boyadag field 55 km from Nebitdag. The field reportedly contains water with concentration of 380 g/m^3 of bromine and 35 g/m^3 of iodine. Plans call for the plant to produce 2,500 t/yr of bromine and 250 t/yr of iodine.

Investment also was being solicited for the construction of the Gograndag iodine and bromine plant at the Gograndag Garadshali field 60 km from Nebitdag. The field contains water with a reported bromine concentration of 403 g/m^3 and an iodine concentration of 32.5 g/m^3. Planned production at the plant i 5,000 t/yr of bromine and 500 t/yr of iodine.

Opportunities for investment existed in the construction of the Goturdepe iodine and bromine production plant at the Goturdepe oilfield where several oil wells are in operation 32 km from Cheleken and 78 km from Nebitdag. The bromine concentration in the water reportedly is 190 g/m^3, and the iodine concentratio 28 g/m^3. Projected production at the plant is between 1,000 an

1,300 t/yr of bromine and 100 and 150 t/yr of iodine.

Investment opportunities also were being promoted for construction of the Achak iodine and bromine plant at a gasfield 18 to 20 km from the village of Gasachak. Reportedly, the bromine concentration in the water is 370 g/m^3, and the iodine concentration 15 g/m^3. The projected capacities of the plant are 2,000 t/yr of bromine and 80 t/yr of iodine.

Investors were being sought for the development of potash production at the Karluskoye deposit 20 km from Gaurdak in the Lebapsky velayat with annual output projected to be between 200,000 and 250,000 t of potassium chloride; for a urea (carbamide) production facility planned at the Chardzhou chemical plant with a projected annual capacity of 350,000 t of urea and 200,000 t of ammonia; and for a sodium carbonate production facility planned near Gaurdak with an annual capacity of 150,000 t.

For development of metallic compounds for the chemical industry, efforts were underway to attract investment to develop magnesia production at the Karabogazsulfate enterprise in the city of Bekdash. Plans called for producing from 5,000 to 12,000 t/yr of magnesium and from 50,000 to 100,000 t/yr of magnesia and for development of a strontium carbonate plant near the Arikskoye and Sakyrtminskoye deposits near Gaurdak. The plant was projected to have an annual production capacity of 20,000 t of strontium carbonate. The construction site is near the existing Gaurdak sulfur plant (U.S. Department of Commerce, July 29, 1997, IMI—Turkmenistan—List of investment projects in the chemical industry, accessed June 4, 1998, at URL http://www.itaiep.doc.gov/bisnis/cables/970730t2.htm).

Turkmenistan considered its major opportunity for economic growth in the production of gas and oil. Most oil production was onshore in the Cheleken district just off the coast of the Caspian Sea. There was also a small amount of offshore production in the Caspian Sea. In addition to currently producing fields, several new large oilfields had been discovered in Turkmenistan that constitute part of a structure extending from the Iranian-Azerbaijani belt to the Tengiz deposit in Kazakhstan.

With already initiated joint ventures, the country could greatly increase production in a few years. In late December 1996, the new "Law On Hydrocarbon Resources" was signed as part of a program to attract foreign investment in its oil and gas sectors. A number of proposed oil investment opportunities were listed on the home page on the World Wide Web for the Embassy of Turkmenistan in the United States.

Estimates of Turkmenistan's proven gas reserves ranged between 98 and 155 trillion cubic feet (2.74 and 4.37 trillion cubic meters). The country's largest natural gas fields are in the Amudarya basin, which contains the Dauletabad-Donmez field with one-half of the country's gas reserves. In addition to the Amudarya basin, Turkmenistan has large gas reserves in the Murgab basin, the site of the giant Yashlar deposit with an estimated 27 trillion cubic feet (760 billion cubic meters) of reserves. Turkmenistan, with the participation of foreign investors, was counting on the development of its large natural gas reserves being the central focus for the country's economic development (U.S. Department of Energy, September 1997, Turkmenistan, accessed August 3, 1998, at URL http://www.eia.doe.gov/emeu/cabs/ turkmen.html).

In 1997, two foreign companies, Argentina's Bridas S.A.P.I.C. and the Unocal Corp. of the United States, were developing Turkmenistan's gas reserves. Bridas, which began its involvement in Turkmenistan in 1991, mainly was focusing on developing the Yashlar deposit and the Keimir oilfield and gasfield. In March, a $180 million agreement was signed by a Dutch subsidiary of South Africa-based Bateman Project Holdings to renovate and develop Turkmenistan's gas infrastructure (U.S. Department of Energy, September 1997, Turkmenistan, accessed August 3, 1998, at URL http://www.eia.doe.gov/emeu/cabs/turkmen.html).

Regarding oil development, as of yearend 1997 four foreign companies had concluded agreements for exploration and development. The Netherlands' Larmag Energy Assests had formed the Larmag-Cheleken joint venture to develop three onshore fields near the Caspian Sea. Malaysia's Petronas Bhd. concluded an agreement in 1996 to develop Block N1 in the Caspian Sea (Interfax Petroleum Report, 1998b). In January, Turkmenistan signed a memorandum of understanding with Monument Oil and Gas plc and Mobil Corp. for the exclusive right to negotiate an oil-production-sharing contract that would give these oil companies the sole rights to a 7,712-square mile area in western Turkmenistan from the Cheleken Peninsula to its southern border with Iran. In a separate deal, Mobil joined Monument in another production-sharing agreement for the 771-square mile Nebit Dag area in western Turkmenistan; this area near the Caspian Sea contains five producing fields and additional exploration opportunities (U.S. Department of Energy, September 1997, Turkmenistan, accessed August 3, 1998, at URL http://www.eia.doe.gov/emeu/cabs/turkmen.html). Furthermore, by mid-1998, Turkmenistan expected to sign a number of production-sharing agreements with the winners of a first round of tenders on development of resources in Turkmenistan's sector of the Caspina shelf (Interfax Petroleum Report, 1998b).

Plans called for Turkmenistan to increase oil production to 50 million metric tons per year (Mt/yr) by 2010, primarily through development of fields on the Caspian shelf and in the eastern part of the country in the Amudarya basin (Interfax Petroleum Report, 1998d). Despite Turkmenistan's commitment to increasing oil production, its oil industry continued to be involved in disputes with investors. In November 1995, Bridas had its oil export license suspended by the Turkmenistan Government. In response, Bridas, which had invested more than $400 million in Turkmenistan since 1991, took its case of breach of contract to international arbitration that was set to begin in spring 1997. Larmag also had faced suspension of its oil export license (Energy Information Administration, September 1997, Turkmenistan, accessed August 3, 1998, at URL http://www.eia.doe.gov/emeu/cabs/turkmen.html).

Turkmenistan had two refineries, the Turkmenbashi (formerly Kranovodsk) and the Chardzhou. In 1996, Turkmenistan signed an agreement with the Israeli firm Merhav to head the project to upgrade the Turkmenbashi refinery, the country's largest (Interfax Petroleum Report, 1998g). Involved in the modernization was a consortium comprising of SNS Lavalin International of Canada, Baran Energies of Israel, and the Swedish-Swiss engineering firm Asea Brown Bovari (ABB). Other foreign firms involved in reconstructing the refinery included Japan's Chioda and Nichimen and Turkey's Gamma, which will install hydrofining and catalytic cracking units; a consortium of France's Technip and Iran's National Iranian Oil Company, which will build a catalytic cracking unit; Germany's Mannesman, which will build an 80,000-t/yr-capacity production unit for basic oils, lubricants, and paraffin; and Japan's Itochu, Nishio-Ivai, and JVC, which will install a 90,000-t/yr-capacity propylene unit. The reconstruction, to be completed in 1999, would boost total capacity at the refinery to 6 Mt/yr. According to the Turkmenistan Statistics and Forecasting Agency, oil refining increased by 5.1% in 1997 compared with that of 1996 reaching 4.7 Mt (Interfax Petroleum Report, 1998g).

Turkmenistan was a net importer of coal. Plans called for developing the Tuarkyrskoye deposit in the northwestern part of the country. Total reserves reportedly were estimated to be 800 Mt. Iran was assisting with the feasibility study and in the development of the first section of the deposit, which has estimated reserves of 25 Mt (Energy Information Administration, September 1997, Turkmenistan, accessed August 3, 1998, at URL http://www.eia.doe.gov/emeu/cabs/turkmen.html).

The country's potential to develop its industrial mineral resources depends, in part, on its ability to transport these minerals effectively. Turkmenistan is on the Caspian Sea, which is entirely inland; the country borders Uzbekistan, Kazakhstan, Iran, and Afghanistan. To the north and east, Turkmenistan is surrounded by desert, and to the south, by mountains. The distances involved are major obstacles for transport and trade. Ashgabat, the capital, is approximately 3,000 km by accessible surface transport routes from the Black Sea and from Moscow and approximately 1,500 km from the Persian Gulf and Indian Ocean.

To provide better transportation corridors for its foreign trade, the Government accelerated the construction of new railroads and the electrification of existing ones. The most important railway was the Tedzhen-Serakhs line, inaugurated in May 1996, with the commissioning of a 190-mile railway linking the northeastern Iranian city of Mashhad and the Turkmen town of Tedzhen, which is a stop on the Turksib railway. This new rail link would open a new trade route to Europe and to the Far East and provide landlocked Turkmenistan with access to Iran's Persian Gulf ports. A planned north- to- south system would provide service to western Russia, northern Europe, and the Indian Ocean. New lines were also under construction in the north of the country to connect inland oilfields and gasfields to the existing railway network (Embassy of Turkmenistan, Infrastructural reform—Railways, roads, air and maritime transport, accessed September 2, 1998, at URL http:www.dc.infi.net/~embassy/transp.html).

Turkmen Otoyollari, the agency responsible for the construction of Turkmenistan's roads, identified a system of roadways that needed to be upgraded. This upgrading, now underway, is a major effort to raise the standard of roads so that large trucks can be driven through Turkmenistan (Embassy of Turkmenistan, Infrastructural reform—Railways, roads, air and maritime transport, accessed September 2, 1998, at URL http:www.dc.infi.net/~embassy/transp.html).

Turkmenistan was resolving its major mineral transport issue which was to construct alternative pipeline routes through which it could export its natural gas to world markets. Gas from Turkmenistan had been sent to consumers through pipeline routes passing through Uzbekistan, Kazakstan, and Russia. After Turkmenistan had gained its independence, it encountered the problem of selling its fuel. Although it had produced an average of 80 billion cubic meters per year of gas in the last years of the Soviet Union, it had sent more than 95% of its gas production to Russia, Ukraine, the Caucasus republics, and the countries of Eastern Europe and Western Europe. Following the dissolution of the Soviet Union, the CIS countries, including Azerbaijan, Armenia, Georgia, and Ukraine, had been ordering and receiving gas from Turkmenistan without being able to pay for it. Russia, which controlled the pipeline route, insisted that Turkmenistan continue supplying these countries. The Turkmenistan Government, which did not want to supply gas without getting paid, stopped shipments to these countries. Turkmenistan was then faced with the problem that the only alternative to using the main CIS pipelines was to build new pipelines.

One alternate pipeline route was completed in December 1997, despite opposition from the United States. It is a 125-mile pipeline linking gasfields in western Turkmenistan with the gas distribution system in Iran's industrialized north (Energy Information Administration, September 1997, Turkmenistan, accessed August 3, 1998, at URL http://www.eia.doe.gov/emeu/cabs/turkmen.html).

A proposed route is a 2,000-mile pipeline beginning in Turkmenistan, passing through Iran into Turkey, and eventually continuing on to Europe. This project would fulfill the terms of a memorandum signed in May 1997 by Turkmenistan, Iran, and Turkey to provide 1,059 billion cubic feet (approximately 30 billion cubic meters) per year of Turkmenistan natural gas to Europe via Iran and Turkey. Italy's Snamprogetti, Gaz de France, and Royal/Dutch Shell expressed interest in forming a consortium to construct the proposed pipeline. In a demonstration of support for Turkmenistan and Turkey, the United States announced in July 1997 that it would not oppose the construction of this line (Energy Information Administration, September 1997, Turkmenistan, accessed August 3, 1998, at URL http://www.eia.doe.gov/emeu/cabs/turkmen.html).

In December, it was announced that Royal Dutch/Shell would be the chief operator of the project to build this pipeline (Interfax Petroleum Report, 1998f). Plans called for it to reach the Turkish-Bulgarian border by 2001. The routing and whether or not it would be extended into Europe was still not determined.

Another proposal called for constructing a new pipeline extending from Turkmenistan to Pakistan via Afghanistan. In July 1997, officials from Turkmenistan and Pakistan and representatives from Unocal and Saudi Arabia's Delta Oil signed an agreement to build the pipeline. It would transport up to 700 billion cubic feet (almost 20 billion cubic meters) per year of gas from Turkmenistan's largest gasfield at Daulatabad to Pakistan where local gas reserves are in short supply. The agreement called for a consortium to be formed by October 1997 and construction to begin by December 1998 and be completed by 2001. Unocal had also proposed to add a nearly 400-mile spur to New Delhi, India. Despite the agreement, significant obstacles for the pipeline remained. These included Bridas being poised to take legal action against Unocal and Delta for allegedly conspiring to undermine its efforts to build a Turkmenistan-Afghanistan- Pakistan gas pipeline from its Yashlar field. In addition, owing to the unstable political and military situation in Afghanistan, it could be years before the project became feasible (Energy Information Administration, September 1997, Turkmenistan, accessed August 3, 1998, at URL http://www.eia.doe.gov/emeu/cabs/turkmen.html).

Other natural gas export pipeline projects being considered included one under the Caspian Sea. Turkmenistan also could serve as a transit country for oil piped from Kazakhstan to the Persian Gulf via Turkmenistan and Iran. Negotiations on the construction of such a pipeline were underway with Mitsubishi, Exxon, and China's CNPC (Interfax Petroleum Report, 1998a).

Turkmenistan was engaged in two separate disputes involving Caspian Sea oil reserves. The first involved a deal between Azerbaijan and an international consortium to develop three fields in the central part of the Caspian Sea— the Azeri, the Chirag, and the Guneshl. Turkmenistan claimed sovereignty over the oil reserves from the Azeri and parts of the Chirag fields, while Azerbaijan maintained that the fields lie within its sector of the Caspian Sea. Azerbaijan began pumping oil from the fields in late August. The second dispute involved a July 4 agreement between Rosneft and Lukoil, both of Russia, and Azerbaijan's state oil company, Socar, to develop the Kyapaz field, which has estimated crude oil reserves of 50 Mt. The Turkmen Government contested the deal as being illegal, claiming that the field, which it calls Serdar, is in Turkmenistan's territorial waters. Following Turkmenistan's protest, the Russian government annulled the deal in August (Energy Information Administration, September 1997, Turkmenistan, accessed August 3, 1998, at URL http://www.eia.doe.gov/emeu/cabs/turkmen.html).

At a meeting in August, Russia recognized Turkmenistan's claim to the disputed field. Azerbaijan announced that it would apply sanctions against any oil company bidding on a disputed field. Mobil, which was planning to sign a memorandum of understanding on developing the Serdar field with Turkmenistan, canceled the planned signing (Interfax Petroleum Report, 1998c).

With the resolution of pipeline development issues that will enable Turkmenistan to get its gas to world markets, the country will be in a position to realize its great potential as a supplier of natural gas. This will boost the country's foreign currency earnings considerably. Like other countries that have large earnings from the export of oil or gas, Turkmenistan, however, will have to ensure its future through balanced development. The country has a number of important industrial mineral resources that could be used to supply regional and world markets with raw materials and downstream products. The country will be better able to focus on the development of these resources and mineral products after the issue of gas transport is resolved, which will provide the country with a more secure economic base and a more favorable investment climate.

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Major Sources of Information

Turkmen-American Business Cooperation Council
Washington, DC 20008
Telephone: (202) 588-1500
Fax: (202) 588-0697
Turkmenistan Chamber of Commerce
92 Kemine St.
Ashgabat, Turkmenistan
Telephone/Fax: (993)(12) 47-44-19
Ministry of Oil and Gas Industry and Mineral Resources
28 Gogolia St.
Ashgabat, Turkmenistan
Telephone: (993)(12) 29-38-27
Fax: (993)(12) 51-04-43
Ministry of Foreign Economic Relations
92 Kemine St.
Ashgabat, Turkmenistan
Telephone: (993)(12) 29-75-11
Fax: (993)(12) 29-75-24
Ministry of Energetics and Industry
Nurberdy Pomma St. #6
Ashgabat, Turkmenistan
Telephone: (993)(12) 51-08-82
Fax: (993)(12) 29-06-82
State Agency for Foreign Investment
Azadi St. 51
Ashgabat, Turkmenistan 74400
Telephone: (993)(12) 35-02-31, or 35-03-18
Fax: (993)(12)35-04-15
State Commodity and Raw Materials Exchange (CRME)
Magtumgulyi St. #111
Ashgabat, Turkmenistan
Telephone: (993)(12) 25-43-21
Fax: (993)(12) 51-03-04
Ministry of Construction Materials
Ashgabat, Turkmenistan

TABLE 1
TURKMENISTAN: REPORTED PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997
Bentonite		NA	NA	NA	137,161	137,321
Bischofite		NA	NA	28,266	3,230	90
Cement		1,100,000	700,000	437,300	450,500	601,000
Epsomite		NA	NA	1,500	14,250	NA
Ferrous bromide (51% Br)		NA	NA	200	255 r/	83
Gypsum		NA	NA	216,427	169,577	35,324
Lime		NA	NA	NA	9,000	16,000
Natural gas	million cubic meters	65,300	35,700	32,300	35,200	17,300
Nitrogen (N content of ammonia)		NA	NA	NA	83,433	60,959
Petroleum, crude		4,900,000	4,400,000	4,500,000 r/	4,300,000 r/	4,700,000
Salt		NA	NA	NA	255,738	216,500
Sodium sulfate		NA	NA	22,226	30,820	56,552
Sulfur		NA	NA	7,913	8,112	9,227

r/ Revised. NA Not available.

1/ Table includes data available through December 10, 1998.

TABLE 2
TURKMENISTAN: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity		Major operating company	Location of main facilities	Annual capacity e/
Ammonia		Maryzaot Association	Mary region	400000 1/.
Bentonite		Oglanly Mine	Oglanly region	100,000 1/.
Cement		Byuzmein cement plant	Byuzmein	1,000,000 1/.
Gypsum		IA Turkmenmineral	Mukry, Tagorin deposits	300,000 1/.
Do.		Wastes from Gaourdak sulfur deposit	Gaourdak	400,000 1/.
Iodine and bromine		Cheleken plant	Cheleken region	355 (iodine) 1/. 4,740 (bromine) 1/
		Nebitdag plant	Vyshka	255 (iodine) 1/. 2,370 (bromine) 1/.
Natural gas	billion cubic meters	Deposits: Achakskoye, Gygyrlinskoye, East and West Shatlykskiye, North and South Naipskiye, Dauletabad-Donmezskoye	Northeastern, eastern southeastern, and southwestern part of country	90 total.
Petroleum:		Deposits:		
Crude		Nebitdag, Cheleken, Kum Dag, Koturtepinskoye, Barsa-Gelmesskoye, Burunskoye, Kuydzhikskoye, Gograndagskoye, Okaremskoye, Kamyshldzhinskoye	Southwestern part of country on Caspian Sea	5,500,000 total.
Refined		Chardzhou refinery	Chardzhou	6,000,000.
		Turkmenbashi refinery	Krasnovodsk	5,000,000.
Sodium sulfate		Karabogazsulfate Association	Bekdash	400,000 1/.
Sulfur		IA Turkmenmineral	Gowurdak (formerly Gaurdak) deposit	340,000 1/.

e/ Estimated. NA Not estimated.

1/ Reported number.

THE MINERAL INDUSTRY OF

UKRAINE

By Richard M. Levine

Ukraine continued to be a major producer of coal, ferroalloys, ilmenite, iron ore, manganese ore, and steel. Also, the country was a producer of a number of other mineral products, including alumina, aluminum, cadmium, germanium, secondary lead, mercury, nickel in ferronickel, magnesium, rutile, titanium dioxide, uranium ore, secondary zinc, zircon, and zirconium, and a large number of industrial minerals, including dolomite, graphite, kaolin, limestone fluxes, potash, quartz, salt, soda ash, and a variety of building materials. As has been the case with nickel where it appears that mining has ceased, it is possible that for certain other mineral products the country has ceased or sharply reduced production.

In 1997, Ukraine's gross domestic product decreased by 3.2% compared with that of 1996, and industrial output decreased by 1.8%. In value of output compared with that of 1996, production increased in the ferrous metals sector increased 7.5%, the fuel sector by 4.5%, and the nonferrous metals sector by 2.7%, and production decreased in the chemicals and petrochemicals sector by 0.6%, the construction materials sector by 7.9%, and the power sector by 2.6% (Interfax Statistical Report, 1998a). A large percentage of transactions in the industrial sectors, however, was in the form of barter trade (Interfax Statistical Report, 1998b).

In 1997, mineral products composed a major segment of foreign trade. According to trade data available for the first 5 months of the year, metallurgical products accounted for 43% of the country's exports, and mineral fuels and petroleum products, 46.3% of imports (Interfax Statistical Report, 1998c). Russia remained Ukraine's major supplier of mineral fuels.

Practically all Ukrainian enterprises for mining and processing mineral raw materials for ferrous metallurgy were part of the State firm Ukrrudprom, which accounted for more than 95% of the country's production capacity for this sector. In 1997, Ukrrudprom employed 120,000 workers and produced output valued at 2.9 billion hrivnas (as of January 1, 1998, one hrivna was worth $0.535).

Despite some improvement in volume of production in 1997, the general situation in Ukraine's ferrous metals sector was described by Ukrainian specialists as very serious (Gornyy Zhurnal, 1998). The companies that were part of Ukrrudprom were working under strained economic conditions that included scarcity of fuel, lack of operating capital, longstanding debts, unpaid receipts, and other difficulties that hindered normal operations. Problems were compounded by more difficult mining conditions. The majority of underground mines were operating at depths of more that 1,000 meters, and open pits, at depths of more than 300 meters (Gornyy Zhurnal, 1998).

Funds to replenish capacities that had been obtained from the Government during the Soviet era were no longer available, which resulted in a sharp curtailment in investment. From 1990 to 1997, the decrease was more than fivefold in capital investment in the ferrous metals sector. It was predicted that if this situation was not corrected, then ferrous metals mining in Ukraine could cease within 3 to 5 years. The situation with tailings ponds was described as being catastrophic as many of the major mining concerns had less than 2 years of space remaining for tailings (Gornyy Zhurnal, 1998).

The situation regarding the condition of equipment and availability of spare parts was considered to be equally dire. Most of the needed equipment was manufactured abroad, but the industry lacked funds to purchase this equipment. Since the Soviet era, labor productivity had fallen in half. Also, with the end of Government subsidies and prices, enterprise production costs had more than doubled. Costs were increasing particularly for transporting output (Gornyy Zhurnal, 1998).

To address these severe problems, the Government formulated a plan for the development of the mining and metallurgical sectors that stressed the development of domestic and export markets and the closing of unprofitable enterprises. The thrust of the program is to increase enterprise profitability and the competitiveness of Ukrainian products (Gornyy Zhurnal, 1998).

In 1997, Ukraine's ferrous mining and metallurgical sector accounted for 27.2% of Ukraine's industrial output; output for a number of major products increased, reversing the downward trend of the past several years. Exports grew significantly, particularly to countries of Southeast Asia. Exports accounted for more than 70% of the output of the iron and steel sector (Interfax-M&CN, 1998).

Ukraine was a large alumina producer with production centered at the Mykolayiv alumina refinery and was also a major mining center for titanium raw materials. Mykolayaiv operated entirely on imported raw material. In 1997, the Mykolayiv refinery, with the capacity to produce more than 1 million metric tons per year of alumina, employed about 6,500 workers. It sold its output to aluminum smelters in Russia, as well as to the Tajik aluminum smelter in Tajikistan. The country exported all titanium ore intended for metal production as domestic sponge production at the Zaporizhzhya titanium-magnesium plant had ceased. In an effort to initiate gold mining, Ukraine was seeking investors to develop some identified deposits. The country had also identified a copper deposit in the Volyn' region for which it was seeking investment(Interfax-M&CN, 1998).

Although the country produced some oil and gas, Ukraine remained primarily a coal producer. The coal sector, however, was facing problems at least as serious as those faced by the ferrous metals sector, and its future would depend on it being fundamentally restructured to increase efficiency.

At the end of the Soviet period, Ukraine was the U.S.S.R.'s leading iron ore producer and second-ranking steel producer (after Russia). In 1997, Ukraine produced more than 25 million metric tons and ranked seventh among world steel producers, after China, Japan, the United States, Russia, Germany, and the Republic of Korea. It has the world's second largest manganese deposits and produced low-grade manganese ore at a rate that had made it a world leader in volume of output as recently as 1992. Since then, however, economic difficulties and the decline in demand in domestic and traditional markets in the former Soviet Union (FSU) and East Europe have cut output almost by one-half.

There also is in place in Ukraine a very large metal-consuming sector in the form of the FSU's second largest, after Russia's, machine manufacturing and metal working industry. Reflecting its former role in the Soviet machine-building industry, Ukraine specialized in heavy machine manufacturing, generally producing the equipment that requires the highest quantities of steel. The country was noted for the production of metallurgical and mining excavation equipment (Kramatorsk); machinery used in electricity generation, such as turbines and generators (Kharkiv), transportation equipment [e.g., automobiles (Zaporizhzhya and Lutsk), heavy transport trucks (Kremenchug), and locomotives (the largest locomotive plant in the FSU is in Luhansk)]; shipbuilding [Mykolayiv (three shipyards specializing in deep-sea vessels) and Kherson], agricultural machinery [e.g., tractor engine production in Kharkiv and plants (Kharkiv and Dnipropetrovs'k)], machine tools, and machinery for the food-processing machinery.

In addition, about one-third of the U.S.S.R.'s defense industrial capacity, including tank production, naval shipbuilding (including aircraft carriers), electronics, aircraft components, and armaments was in Ukraine. Also, a wide range of metal-working activity, such as the ball-bearing plant in Lutsk, supplied automobile, truck, tractor, and bus plants in Ukraine, Belarus, and Russia with needed inputs. This metal-consuming sector was, by and large, spatially coincident with the ferrous metals industry, from which it derived most of its inputs.

Ukraine has many essential, already developed raw material sources and metallurgical facilities close to each other; a generally favorable location along the western border of the FSU, as well as frontage on the Black Sea; a trained and inexpensive labor force; and a large number of diverse metal-consuming industries with functional linkages to the iron and steel mills. However, it is still not clear, exactly where the country's industries comparative advantage will lie. Ukraine has developed its resources and processing and manufacturing facilities to a scale at which it could be an important producer of ferrous metals and machinery, provided that investment for modernization is forthcoming and is directed into activities that are economically rational.

This 1997 report on Ukraine's mineral industry is abbreviated. For more detailed textual coverage, please refer to the U.S. Geological Survey's 1996 report.

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Major Sources of Information

Ministry of Economics
12/2, M. Hrushevskoho Vul.
Kyiv 252008, Ukraine
Telephone:(380-44) 293-0683, 293-9394
Fax: (380-44) 226-3181
Ministry of Energy
30, Khreshchatyk Vul.
Kyiv 252601, Ukraine
Telephone: (380-44) 226-3027
Fax: (380-44) 224-4021
Ministry of Environmental Protection and Nuclear Safety
5, Khreshchatyk Vul.
Kyiv 252001, Ukraine
Telephone: (380-44) 226-2428, 226-2577, 228-0644
Fax: (380-44) 229-8383
Ministry of Foreign Economic Relations and Trade (MFERT)
8, Lvivska Ploshcha,
Kyiv 254655, Ukraine
Telephone:(380-44) 226-2733
Fax: (380-44) 212-5238
Ministry of Industrial Policy
3, Surykova Vul.
Kyiv 252035, Ukraine
Telephone: (380-44) 246-3201, 245-4748
Fax: (380-44) 245-6209
Ministry of Transportation
7/9, Shchorsa Vul.
Kyiv 252006, Ukraine
Telephone: (380-44) 269-1141, 226-2204
Fax: (380-44) 268-2202
Ministry of Coal Industry
4, Bohdana Khmelnytskoho Vul.
Kyiv 252001, Ukraine
Telephone: (380-44) 228-0372
Fax: (380-44) 228-2131
State Committee of Statistics
3, Shota Rustaveli Vul.
Kyiv 252023, Ukraine
Telephone:(380-44) 227-2433
Telephone/Fax: (380-44) 227-4266
Fax: (380-44) 227-6611
State Customs Service
21, Dehtyarivska Vul.,
Kyiv 254050, Ukraine
Telephone:(380-44) 274-8298
Fax: (380-44) 274-8281
State Committee on Oil & Gas and Oil Refinery Industry
60, Artema Vul.
Kyiv 254050, Ukraine

Telephone:(380-44)219-1101, 226-3482
Fax: (380-44) 211-3010

State Tax Administration of Ukraine
8, Lvivska Ploshcha,
Kyiv 254655, Ukraine
Telephone:(380-44) 226-2061
Fax: (380-44) 212-4597

National Agency of Ukraine for Development and European Integration (NAUREI)
19a, Bohdana Khmelnytskoho Vul.,
Kyiv 252030, Ukraine
Telephone:(380-44) 224-8932, 224-1933, 224-4201
Fax: (380-44) 224-7312, 224-2567

Program for Encouraging Foreign Investment
Ministry of Economy
30, Dmytrivska Vul.,
Kyiv 252054, Ukraine
Telephone:(380-44) 216-6512
Fax: (380-44) 216-6581

Department of Methodological Assistance for Foreign Investors
18/9, Kutuzova Vul., Room 621,
Kyiv 252133, Ukraine
Telephone/Fax: (380-44) 294-4455

State Patent Agency of Ukraine
8 Lvivska Ploshcha,
Kyiv 254655, Ukraine
Telephone: (380-44) 212-5082
Fax: (380-44) 212-3449

TABLE 1
UKRAINE: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1993	1994	1995	1996	1997 e/
METALS					
Alumina e/	1,010,000 r/	1,070,000 r/	1,100,000 r/	1,000,000 r/	1,000,000
Aluminium: e/					
Primary	100,000	100,000	98,000 2/	90,000 r/	100,500 2
Secondary	50,000	40,000	40,000	40,000	40,000
Total	150,000	140,000	138,000	130,000 r/	140,500
Cadmium, metal e/	7	10 2/	15	25 r/	25
Germanium e/	21	22 2/	22	22	22
Iron and steel:					
Iron ore, marketable	65,500,000 r/	51,300,000	50,400,000	47,600,000	53,000,000
Metal:					
Pig iron	26,999,000	21,200,000	20,000,000	18,143,000	20,561,000 2
Ferroalloys: e/					
Blast furnace:					
Ferromanganese	40,000	30,000	25,000	25,000 r/	30,000
Spiegeleisen	4,000	3,000	2,500	2,500 r/	2,500
Electric furnace:					
Ferromanganese	140,000	170,000	170,000	170,000 r/	160,000
Ferronickel	50,000 r/	23,000 r/	23,000 r/	8,300 r/	--
Ferrosilicon	400,000	300,000 r/	300,000	300,000	300,000
Silicomanganese	735,000	600,000	600,000	600,000 r/	560,000
Other	30,000	25,000	25,000	25,000	25,000
Total	1,399,000 r/	1,151,000 r/	1,145,500 r/	1,130,800 r/	1,077,500
Steel:					
Crude	32,357,000 r/	23,798,000	22,309,000	22,100,000	25,600,000 2
Finished	24,200,000	16,900,000	16,600,000	17,100,000	19,500,000 2
Pipe e/	3,000,000	1,600,000 2/	1,500,000	2,000,000	1,800,000 2
Lead, refined (secondary) e/	17,000 r/	9,000 r/	14,000 r/	21,000 r/	18,000
Magnesium e/	14,900 r/	12,000	10,000 r/	10,000 r/	10,000
Manganese:					
Marketable ore	3,800,000	2,979,000 r/	3,200,000	3,070,000 r/	3,040,000 2
Mn content e/	1,350,000	1,050,000	1,100,000	1,040,000 r/	1,030,000
Mercury	50 r/	50 r/	40 r/ e/	30 r/ e/	25
Nickel, mine output, metal content e/	3,000 r/	1,400 2/	1,400	500 r/	--
Silicon e/	1,300	1,400 2/	1,400	1,000	1,000
Tin e/	3,000	2,000	2,000	2,000	2,000
Titanium:					
Ilmenite concentrate	450,000 e/	530,000	359,000	420,000 r/ e/	420,000
Rutile concentrate	60,000 e/	80,000	112,000	180,000 r/ e/	180,000
Metal, sponge	10,000 e/	5,000 e/	300	--	--
Zinc, metal e/	15,000	14,000 r/	5,000 r/	2,000 r/	2,000
Zirconium concentrates e/	70,000 r/	65,000 r/	60,000 r/	55,000 r/	65,000
INDUSTRIAL MINERALS					
Cement	15,000,000	11,400,000	7,600,000	5,000,000	5,100,000 2
Graphite e/	40,000 r/	30,000 r/	30,000 r/	25,000 r/	25,000
Nitrogen, N content of ammonia e/	3,242,000 2/	3,000,000	3,100,000	3,300,000	3,400,000
Potash, K_2O content	88,000 r/ e/.	168,000	110,000	100,000	100,000
Salt e/	4,000,000 r/	3,500,000 r/	3,000,000 r/	2,800,000 r/	2,500,000
Soda ash e/	NA	NA	NA	375,000	367,000 2
Sulfur, native	500,000 r/ e/	392,000	310,000	170,000	100,000
MINERAL FUELS AND RELATED MATERIALS					
Coal	115,700,000	95,300,000	83,600,000	75,500,000 r/ e/	76,300,000 2
Coke e/	25,000,000	17,000,000	17,000,000 2/	28,650,000 r/	31,800,000 2
Natural gas thousand cubic meters	19,200,000	18,300,000	18,170,000	18,400,000	18,100,000 2
Petroleum:					
Crude	4,250,000	4,200,000	4,100,000	4,100,000	4,100,000 2
Refined e/	NA	NA	NA	13,500,000	12,800,000 2
Uranium concentrate, U content	500	500	500	500	500

e/ Estimated. r/ Revised. NA Not available.

1/ Table includes data available through April 4, 1999.

2/ Reported figure.

TABLE 2
UKRAINE: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Metric tons unless otherwise specified)

Commodity	Major operating facilities	Location 1/	Annual capacity e/
Alumina	Mykolayiv refinery	Mykolayiv (Nikolayev)	1,200,000
Do.	Zaporizhzhya (Dneprovsk) refinery	Zaporizhzhya (Zaporozhye)	245,000.
Aluminum, primary	Zaporizhzhya (Dneprovsk) smelter	do.	110,000.
Coal:			
Hard	Donets coal basin with about 225 mines produces more than 90% of Ukraine's coal	Donetska (Donetskaya), Dnipropetrovska (Dnepropetrovskaya) and Luhanska (Luganskaya) oblasts	130,000,000.
Do.	Lviv-Volynskiy basin produces remainder from 18 mines	Western Ukraine	6,000,000.
Brown	Dneprovskoye basin	Central Ukraine	7,000,000.
Dolomite	Novotroitskoye, Severskoye mining administrations	Novotroitskoye deposit,Yamskoye deposit	3,000,000 (total).
Do.	Dokuchayevskiy Flux-dolomite complex	Yelenovskoye and Stylskoye deposits	
Ferroalloys	Nikopol ferroalloys plant	Nikopol	250,000 (ferromanganese). 1,200,000 (silicomanganese). 3,000,000 (manganese sinter).
Do.	Stakhanov plant	Luhansk	NA (ferrosilicon).
Do.	Zaporizhzhya plant	Zaporizhzhya	300,000 (ferrosilicon). 160,000 (silicomanganese). NA (ferrochrome). NA (ferromanganese). 40,000 (manganese metal).
Graphite	Zavalyevskiy graphite complex	Zavalyevskiy deposit	80,000.
Iron ore	Underground mining:		
Do.	Krivbassruda production association with 16 mines	Kryvyy Rih (Kryvoy Rog) basin	30,000,000.
Do.	Eksplutatsionnaya Mine of the Zaporizhzhskiy iron ore complex	do.	3,500,000.
Do.	Open pit mining: Yuzhniy, Novokrivorozhskiy, Tsentralnyy, Severnyy, Inguletskiy, Poltaviskiy and Kamysh-Burunskiy mining and beneficiation complexes	do.	90,000,000 (total).
Lead, secondary	Ukrtsink plant	Kostyantynivka (Konstantinovka)	70,000
Magnesium	Zaporizhzhya plant	Zaporizhzhya	10,000.
Do.	Khlorvinil concern	Kalush	20,000.
Manganese ore, marketable	Ordzhonikidze, Marganets mining and beneficiation complexes	Nikopol basin	7,000,000 (total).
Do.	Tavricheskiy mining and beneficiation complex (under development)	Bolshoy Tomak basin	
Mercury	Nikitovskiy mining and metallurgical complex	Donets basin	120.
Nickel	Pobuzhhskiy mining and metallurgical complex, comprising three open pit mines and smelter	Pobuga region	7,000 (nickel in ferronickel).
Potash	Khlorvinil production association, Stebnik potash plant	Pricarpathian region	300,000 (K_2O).
Steel, crude	Alchevsk plant	Alchevsk (Kommunarsk)	4,500,000.
Do.	Azovstal plant	Mariupol	4,000,000.
Do.	Dneprospetssstal	Zaporizhzhya	1,400,000.
Do.	Dneprovsk plant	Dniprodzerzhynsk (Dneprodzerzhinsk)	3,850,000.
Do.	do.	Dnipropetrovsk (Dnepropetrovsk)	1,900,000.
Do.	Donetsk plant	Donetsk	1,300,000.
Do.	Yenakiyeve plant	Yenakiyeve (Yenakiyevo)	3,100,000.
Do.	Il'yich plant	Mariupol	7,300,000.
Do.	Kirov plant	Makeyevka	4,000,000.
Do.	Kryvyy Rih plant	Kriyvyy Rih	10,650,000.
Do.	Zaporizhzhya plant	Zaporizhzhya	2,300,000.
Sulfur	Sera production association	Rozdol mining complex mines, Rozdol, Soroks, Zhidachev Deposits. Yavorov complex mines. Nemirov and Yazov deposits in (Lvivska) (Lvovoskaya) and Kyyivska (Kievskaya) oblasts	1,500,000 (total).

See footnotes at end of table.

TABLE 2--Continued
UKRAINE: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Metric tons unless otherwise specified)

Commodity	Major operating facilities	Location 1/	Annual capacity e/
Titanium, ilmenite and zircon-rutile-ilmenite ores	Irshanskiy mining and beneficiation complex	Irsha River valley	600,000 (ilmenite concentrate). 2/
Do.	Verkhnedneprovskiy mining and metallurgical complex	Verkhnedneprovsk region	120,000 (rutile concentrate). 40,000 (zirconium concentrate).
Titanium, metal	Zaporizhzhya plant	Zaporizhzhya	20,000.
Uranium	Zheltye Vody complex	Northern part of Kryvyy Rih basin	NA.
Zinc, secondary	Ukrtsink plant	Kostyantynivka	25,000.

e/ Estimated NA Not available.

1/ Old name or spelling, if applicable, given in parenthesis.

2/ Total for both enterprises.

TABLE 3
UKRAINE: EXPORT OF MINERAL RAW MATERIALS FOR FERROUS METALLURGY

(Million metric tons)

Commodity	1990	1991	1992	1993	1994	1995	1996	1997
Agglomerate	11.75	7.51	6.92	7.33	7.36	6.08	7.08	7.96
Iron ore concentrate	5.47	3.87	4.48	4.81	4.77	5.72	5.5	6.2
Limestone, metallurgical	3.39	3.6	3.51	1.54	1.94	1.4	1.41	0.88
Manganese concentrate	0.11	0.17	0.13	0.1	0.2	0.08	0.1	0.23
Pellets	7.22	5.06	4.79	5.48	5.49	6.62	6.29	7.46

Source: Gornyy Zhurnal, no. 11-12, November-December 1998, p. 9.

TABLE 4
UKRAINE: SELECTED LAWS PERTAINING TO THE MINERAL INDUSTRY

Law number	Title	Issuance date	Summary
188/98-BP	On main directions of the state policy of Ukraine in the sphere of environment protection, use of natural resources, and securing ecological safety	March 5, 1998	Enacts to approve main directions of the state policy of Ukraine in the sphere of environment protection, use of natural reources, and securing ecological safety; ordered the Cabinet of Ministers to secure implementing the said directions.
38/98-BP	On ratification of the agreement on cooperation in the area of studying, prospecting, and using mineral and raw material resources	January 16, 1998	Law 38/98-BP of January 16, 1998, on ratification of cooperation in the area of studying, prospecting, and using mineral and raw material resources; ratifies the said agreement, signed on March 27, 1997, in Moscow.
645/97-BP	On mining and processing uranium ores	November 19, 1997	Regulates special aspects of legal regulations while mining and processing uranium ores and using products of their processing as a raw material for getting a nuclear material. Establishes special features of uranium objects functioning; protection of personnel, population, and the environment from ionizing radiation; and special aspects of social protection of uranium objects personnel and population in connection with impact of ionizing radiation. Law includes 17 articles.
637/98-BP	On state regulation of mining, production, and use of precious metals and precious stones and control over operations with them	November 18, 1997	Regulates mining, production, use, and safe keeping of precious metals and stones, as well as carrying out control over operations with them. Law includes 6 sections and 22 articles.
638/96-BP	Ratifies agreement between Ukraine and International Bank for Reconstructrion and Development	December 25, 1996	Ratfied the agreement between Ukraine and International Bank for Reconstruction and Development on granting a loan for restructuring coal mining industry, signed on December 12, 1996, in Washington, DC.
385/95-BP	Approves concept of development of Ukraine mining and metallurgical industries complex until 2000	October 17, 1995	Approves concept of development of Ukraine mining and metallurgical complex until 2000. Text is included (two provisions).

This table was prepared with the assistance of Natalie Gawdiak, Research and Information Analyst, Law Library of Congress, and was based on information from the Global Legal Information Network (GLN).

THE MINERAL INDUSTRY OF

THE UNITED KINGDOM

By Harold R. Newman

Mine production of ferrous and nonferrous minerals has been declining for the past 20 years as reserves became depleted. Because processing has become the basis of a large and economically important mineral industry, imports are required to satisfy metallurgical requirements.

Operations in the steel sector showed moderate improvement as the demand for steel increased. The industrial minerals sector has provided a significant base for expanding the extractive industries, and the balance has shifted away from the metallic mineral sector. Companies have a substantial interest in the production of domestic and foreign industrial minerals, such as aggregates, ball clay, gypsum, and kaolin (china clay). *(See table 1.)*

Total production of primary fuels, when expressed in terms of their energy content, was virtually unchanged in 1997 compared with that of 1996. Petroleum accounted for 50% of total energy production; natural gas, 31%; coal, 11%; and primary electricity (nuclear and natural flow hydropower), 8%. The level of coal production in 1997 was one-third that of 1970. Total production of primary fuels has, however, risen by 155% since 1970 mainly because of the growth in production of petroleum and natural gas (Department of Trade and Industry, 1998).

The current statute regarding the development and working of mineral deposits is called the 1971 Act. This Act consolidates all earlier planning legislation and has been amended by various statutes. Minerals were defined in section 209 of the 1971 Act to include all minerals and substances in or under land of a kind ordinarily worked for removal by underground or surface workings; it does not include peat cut for purposes other than for sale. Mineral development was specifically addressed in the Town and Country Planning (Minerals) Regulations, 1971, and the Town and Country Planning (Minerals) Act, 1981.

Mineral rights to mineral fuels, such as coal, petroleum, and uranium, belong to the State. The Coal Authority was authorized to license open-pit and underground mines to the private sector subject to restrictions on size and the payment of a royalty on the amount of coal produced.

Most other mineral rights in Great Britain are privately owned. The exception is gold and silver, the rights to which are vested in the Royal Family and are referred to as "Crown Rights." A different situation regarding mineral rights applies to Northern Ireland where, under the Mineral Development Act (Northern Ireland), 1969, the right to work minerals and the right to license others to do so is vested in the state, as opposed to private ownership.

The Department of Trade and Industry (DTI) ensures a continuing supply of minerals for the country's industry. Its areas of responsibility include all nonenergy minerals, including metallic ores and industrial minerals, including barite, china clay, fluorspar, high-grade limestone, potash, salt, and silica sand. The industrial minerals sector, in particular, is important to the nation's economy. *(See table 2.)*

Through its Metals and Minerals Branch, DTI is responsible for mineral fuels, including coal, natural gas, and petroleum, and for issuing licenses for the exploration, appraisal, and production of natural gas and petroleum. These activities had previously been overseen by the Department of Energy (DOE).

The DOE remained responsible for minerals that are used in the construction industry. These include aggregates, brick and brick clay, cement and its raw materials, dimension stone, gypsum for plaster, and sand and gravel. State and privately owned corporations produce minerals and mineral-based products. State ownership was mostly in the nuclear power industry. *(See table 3.)*

The United Kingdom has shifted from being a net exporter of goods to being a net importer. The export trade was dominated by petroleum. *(See tables 4 and 5.)*

Of the four primary aluminum smelters in the United Kingdom, three were owned and operated by British Alcan Aluminium Ltd., the U.K. subsidiary of Montreal-based Alcan Aluminium Ltd. The fourth smelter, operated by Anglesey Aluminium Ltd., was owned by Rio Tinto Ltd. (51%) and Kaiser Aluminum and Chemical Corp. of the United States (49%). All the aluminum smelters depended on imported alumina for feedstock.

The secondary aluminum metal industry treated recycled aluminum and low-grade aluminum scrap, such as swarf. The main consuming sector for secondary aluminum ingots was the automotive industry. Ellay Enfield Ltd., one of the major independent producers of precision seam-welded aluminum and brass tubing for heat transfer applications in the automotive industry, was acquired by Lausanne Hydro Aluminium Extrusion of Norway for an undisclosed sum (Norsk Hydro ASA, July 11, 1997, Expansion in the UK, accessed September 24, 1998, at URL http://www.hydro.com/konsern/press p19970711134107.shtml).

The MIDAS project, a major investigation of gold mineralization at numerous deposits in the Caledonian and the Hercynian orogenic belts of Europe, was completed under the leadership of the British Geological Survey (BGS). Evaluation of multidisciplinary earth science digital data for selected deposits allowed a classification of the types of gold mineralization to be established. On this basis, metallogenic models were presented in the final report, and the optimum exploration methodology for each deposit type was selected.

Activities in gold exploration and development in the United Kingdom increased in 1997. Northern Ireland, Scotland, and Wales continued to be the three main areas of exploration by companies. Scotland was the most active area with several exploration licenses in effect.

Caledonia Mining Ltd.'s Cononish gold project near Tyndrum, 60 miles north of Glasgow, was placed on a care-and-maintenance basis as a result of delays in completing final designs. Exploration continued on other parts of the exploration license. The deposit, estimated to contain 449,000 metric tons of reserves of ore that can be mined, is contained within a northeast-striking, auriferous, quartz-sulfide vein in quartzites and pelites. The sulfides consist of chalcopyrite, galena, pyrite, and sphalerite; the gold occurs with galena in pyrite microfractures. The mine carries a capital cost of about $13 million and an estimated life of 11 years (British Geological Survey, 1997).

Omagh Minerals Limited, a wholly owned subsidiary of European Gold Resources Inc. (formerly Montenor Resources Inc.) of Canada, received formal Governmental consent for its open-pit gold mine at Cavanacaw, County Tyrone, Northern Ireland. The 189-square-kilometer concession reportedly contains a large number of gold deposits and occurrences apart from established gold resources. A cluster of lode and open-ended shear structures in or adjacent to the Kearney Structure contains an estimated mineral-resource inventory of more than 2 million metric tons of ore grading 6.9 grams per metric ton of gold equating to about 14,000 kilograms. The company estimated that it could have an initial production of more than 500 kilograms per year (kg/yr) of gold and more than 600 kg/yr of silver. Exploration was continuing to define further reserves. This project would be the first gold mine in Northern Ireland (Omagh Minerals Limited, News release, accessed October 20, 1997, at URL http://gold.ica.net/irishpro.htm).

Crediton Minerals Plc., a subsidiary of MinMet Plc. of Ireland, planned to carry out a 2-year exploration program for gold and silver in an area known as the Crediton Trough, located to the north and west of Exeter in Devon. Crediton has secured a prospecting permit from the Crown Estate Commissioners. BGS, appointed to provide technical services and manage the project, found significant detrital gold in the course of stream drainage sampling, and subsequently, geochemical evaluation identified anomalous levels of gold in volcanic rocks of Permian age. The project will focus on locating gold targets at shallow depth (British Geological Survey, 1997).

Production of iron ore was limited to a small amount of hematite ore mined by Egremont Mining Co. at the Florence Mine in Cumbria. Primary steel production was based on imported iron ore, mainly from Australia and Brazil.

British Steel was one of Europe's largest steel producers, and the fifth largest in the world, with group sales of more than $12 billion. About 13 million metric tons per year (Mt/yr) of liquid steel are produced by the basic oxygen steelmaking process. Although traditional ingot casting is still used in the manufacture of certain grades of steel, most of the output is by means of continuous casting.

Section and plate production was principally undertaken at the integrated steelworks of Teesside and Scunthorpe, with the manufacture of pipes and tubes at Corby and Hartlepool and rails at Workington. Flat-rolled strip steel was made at Port Talbot and Llanwern. Further processing was undertaken at Lianelli and Ebbw Vale for tin plate and at Shotten for galvanizing and painting.

Production of tin concentrate continued from the South Crofty Mine in Cornwall in 1997. This one remaining tin mine was, however, scheduled to close in 1998. A rescue package was rejected by the Government. The closure was blamed on the decline in tin prices and the appreciation of the pound sterling, in which the bulk of the company's costs were incurred, against the U.S. dollar (Mining Journal, 1997b).

Strategic Minerals Corp. (Stratcor) announced the construction of a plant that will produce about 100 metric tons per year (t/yr of vanadium pentoxide from "Orimulsion" ash at the company's location near Harwich. The plant will use proprietary Stratcor-developed technology to process ash supplied by utility companies. The ash is a residue generated when bitumen-based fuel is consumed for power generation. Orimulsion fuel was gotten from Venezuela by utility companies that sold the ash to Stratcor. The ash is a low-cost source of vanadium feed (Metal Bulletin, 1997).

The United Kingdom's two largest cement producers were Blue Circle Cement Ltd., with 49% of the domestic market, and Castle Cement Ltd., with more than 25%. Blue Circle stepped up its presence in North America with its first Canadian acquisition. The company agreed to pay $261 million for St. Mary's Cement Corp., which supplied about 25% of Ontario's cement sales (Taylor, 1997).

The United Kingdom was the leading world producer and exporter of ball clay, as well as the world's largest exporter and second-largest producer, after the United States, of kaolin (china clay). Watts, Blake, Bearne & Co. Plc. (WBB) was the country's largest producer of ball clay. WBB Devon Clays Ltd. was responsible for the ball clay operations of WBB. The division operated eight open-pit and three underground mines that had a total combined output of 500,000 t/yr of crude ball clay.

English China Clays Plc. was the largest producer of kaolin and one of the major producers worldwide. Operations were mainly in the southwestern area of the United Kingdom. ECC Ball Clays Ltd. was responsible for the domestic ball clay operations of ECC. The division operated five quarries and three underground mines that have a combined output of 450,000 t/yr of crude ball clay.

ECC International Ltd. (ECCI) operated ball clay and kaolin mines and quarries in the Wareham Basin, Dorsetshire; the Bovey Basin, south Devonshire; and the Petrockstowe Basin, north Devonshire. A majority of the production was from the Bovey Basin.

Fluorspar mining is concentrated in Derbyshire from th Southern Pennine deposit; the major producer was Laport Industries Plc. Laporte operated two underground mines and on open-pit mine. The ore was processed at Laporte's Cavendis Mill near Sheffield.

British Gypsum Ltd., a subsidiary of BPB Industries Plc., wa the major producer of gypsum in the United Kingdom. Th company had mines in Cumbria, Leicestershire, Nottinghamshir Staffordshire, and Sussex that produced about 3 Mt/yr of gypsum With few exceptions, this material went to supply the domest market.

Cleveland Potash Ltd. (CPL), the only potash producer in th United Kingdom, operated the Boulby Mine in Yorkshire. CP also mined rock salt, as a coproduct, from an underlying seam the Boulby Mine. The seam of potash extends out under the North Sea. To reach it, the miners must descend 1,100 meters (m) in a shaft (reputed to be the deepest shaft in Europe) to pass through the potash seam and into the salt below. The potash-to-salt production ratio was about 2 to 1 (Cleveland Potash Ltd., from 1,100 meters down, accessed September 28, 1997, at URL http:///www.clevelandpotash.ltd.uk/ mine.htm).

Most slate mining in the United Kingdom was in northern Wales, with additional mining operations in Cornwall and the Lake District. McAlpine Slate Ltd. was the owner and operator of the Cwt y Bugail, Ffestiniog, Penrhyn, quarries in North Wales. The Penrhyn Quarry, measuring 2,415 by 805 m, was considered to be the world's largest slate quarry and has been in operation for more than 400 years. The company also produced natural slate from its American quarry at Hilltop Slate Inc., New York State. McAlpine Slate produced more than one-half of the United Kingdom's entire production of natural roofing slate. The company exported about two-thirds of its production (McAlpine Slate Ltd., Company information, accessed October 28, 1998, at URL http://www.amslate.com/company.html).

The European Commission authorized the United Kingdom to provide $1.4 billion to its coal industry through 2002. The money would cover liabilities, including environmental damage caused by mining activities and obligations to former workers, such as pension plans and social welfare benefits inherited from the period before British Coal (BC) was privatized. The aim was to ensure that inherited liabilities did not place a burden on mines with prospects of economic viability (Coal Age, 1997).

By the beginning of 1997, most of the coal mining industry was owned by RJB Mining, which operated 16 underground mines. RJB was the largest coal mining company in the United Kingdom and the largest independent coal producer in the European Union. The largest operation was the underground Selby Complex. Midland Mining Ltd., the second largest underground mine producer in terms of output, owned the Silverdale Mine, the deepest coal mine in Europe, and the Annesly-Bentinck Mine. (World Coal, 1997).

RJB Mining announced it would close the Asfordby Mine in Leicestershire. The newest of the U.K. coal mines, Asfordby was given the go-ahead when the coal industry was still under BC's control. Ownership passed to RJB Mining when the industry was privatized in 1994. In the run-up to privatization, the industry had witnessed a major contraction, including the closure of 31 mines in 1992 alone, and Ashfordby had provided a glimmer of hope that U.K. coal mining was not doomed. RJB stated that closing was due to the unique geological conditions of the mine. The company had expended more than $60 million on geological problems and came to the conclusion that working conditions were too unsafe for operations to continue (Mining Journal, 1997a).

Open-pit mines in production in 1997 totaled 116, of which 40 were owned by three companies. RJB Mining owned 20 producing mines, Celtic Energy Ltd. owned 8 mines, and Scottish Coal Company Ltd. had 12 producing mines. The remainder were operated by more than 25 other operators (British Geological Survey, 1997).

The offshore U.K. sector of the North Sea Oilfield, in its 33d year of activity, continued to be significant in international oil and gas activities. As a result, the country had become headquarters for international oil companies and a major energy supplier to other countries.

New petroleum and natural gas discoveries were anticipated with the offer of more than 270 blocks for exploration in frontier areas with the completion of the 17th offshore licensing round in 1997. The blocks are in areas where there has been little or no exploration activity. Most are to the west of Scotland, but others are in the South West Approaches, the northern North Sea, and off the east coast of England.

The exploration drilling success rate increased slightly. In 1997, 16 new discoveries were announced, just 1 more than the 1996 figure. Development drilling offshore added 179 wells, and onshore development drilling accounted for another 17 wells, bringing total United Kingdom drilling in 1997 to 288 wells, a drop of 12.7% from 1996 (World Oil, 1998).

The United Kingdom had an onshore producing oilfield, the Wytch Farm Field in Dorset, containing estimated reserves of 450 million barrels. The field extends offshore under Poole Bay.

Rail and trucking transportation was well developed. The state-owned British Railways operates a 16,629-kilometer (km) 1.435-m standard-gauge system, with 4,205 km of electrified and 12,591 km of double or multiple track. In addition, standard and narrow-gauge lines were privately owned and operated. Northern Ireland Railways operated a 332-km 1.600-m gauge system with 190 km of double track.

All three major steel-producing areas are on or near tidewater. Petroleum refineries are likewise on the coast. The major cargo ports are Bristol, Liverpool, London, and Southhampton in England, Glasgow in Scotland, Cardiff and Milford Haven in Wales, and Belfast in Northern Ireland.

In the United Kingdom and Europe, transportation changed significantly with the completion and operation of the Channel Tunnel. The tunnel, referred to as the "Chunnel," was constructed underneath the English Channel and connects Folkestone, England, and Coquelles, near Calais, France. Everything transported through the tunnel will move by rail. The trip takes about 30 minutes. The Channel Tunnel, linking the two countries, was a vital component of the European single-market concept.

The United Kingdom was a significant player in the world mining and mineral-processing industries. This was more the result of an extensive range of companies in the country, with various interests in the mineral industry international, than production from the domestic industry. This was expected to continue.

Exploration was expected to continue onshore and offshore. Onshore exploration activities will be directed mainly toward precious metals. Offshore exploration interest will continue to be focused on North Sea areas, particularly the areas west of the Shetland Islands, the Central North Sea, and the Southern Gas Basin.

The Department of Trade and Industry's publication "UK Strategy for Sustainable Development" was expected to be used as a significant framework for the development of mineral resources. Efforts to raise the level of environmental management and to maximize the best use of natural resources, including use of recycled materials and alternate sources of energy, will continue.

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Keyworth, Nottingham NG1 25GG
United Kingdom
Central Statistics Office
Great George St.
London, SW1 P3AQ
United Kingdom
Department of Economic Development
(Northern Ireland)
Belfast BT1 3AJ
Northern Ireland
Department of the Environment
Minerals Division
2 Marsham St.
London SW1 P3EB
Department of Trade and Industry
123 Victoria St.
London SW1E 6RB
United Kingdom

TABLE 1
UNITED KINGDOM: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
METALS						
Aluminum:						
Alumina from imported bauxite e/		105,000	105,000	108,000	99,000 r/	100,000
Metal:						
Primary		239,099	231,223	237,899	239,963	247,675 2/
Secondary		274,000	248,900	282,000	257,200 r/	257,800 2/
Cadmium, metal including secondary		458	469	549	541	455 2/
Copper: Metal, refined:						
Primary		10,629	11,078	12,007	12,869	9,000
Secondary		35,949	35,586	42,993	43,746	51,000
Total		46,578	46,664	55,000	56,615	60,000
Iron and steel:						
Iron ore:						
Gross weight		1,068	1,271	1,051	1,180	1,210 2/
Fe content (55% Fe)		253	293	242	271	278 2/
Metal:						
Pig iron	thousand tons	11,534	11,943	12,236	12,830 r/	13,057 2/
Ferroalloys, blast-furnace:						
Ferromanganese	do.	45	--	--	--	--
Steel, crude	do.	16,625	17,286	17,604	18,220	18,528 2/
Rolled products	do.	13,500	14,000	19,119	18,869 r/	20,000
Lead:						
Mine output, Pb content e/		1,000	2,000	1,600	1,800	1,800
Metal:						
Smelter:						
Bullion from imported concentrate		45,183	36,619	41,642	41,991	38,500
Secondary (refined) e/ 3/		154,193	100,000	100,000	100,000	100,000
Total e/		199,376	136,619	141,642	141,991	138,500
Refined:						
Primary 4/		209,560	191,036	149,706	168,108	215,243 2/
Secondary 3/		154,193	161,430	170,998	177,466	175,783 2/
Total e/		363,753	352,466	320,704	345,574	391,026 2/
Magnesium metal, secondary including alloys e/		1,000	1,000	1,500	1,000	1,000
Nickel metal, refined e/ 5/		28,000 r/	28,400	35,156 r/	38,561 r/	36,586 2/
Tin:						
Mine output, Sn content		2,232	1,922	1,972	2,103	2,396 2/
Metal, secondary (refined) e/		100	100	100	100	100
Zinc: Metal, smelter		102,391	101,300	105,998	96,867	107,704 2/
INDUSTRIAL MINERALS						
Barite 6/		32,623	54,000	85,000 e/	102,000	74,000
Bromine		27,423	33,800	26,200	30,600 r/	30,000
Cement, hydraulic	thousand tons	11,039	12,307 r/	11,805	12,214 r/	12,900
Clays:						
Fire clay	do.	479	679	708	536 r/	550
Fuller's earth 7/	do.	187	134	132	143 r/	140
Kaolin (China clay) 8/	do.	2,577 r/	2,654 r/	2,586	2,281 r/	2,400
Ball clay and pottery clay 8/	do.	746	825	893	866	900
Other, including shale	do.	10,891	12,464	14,000 e/	13,000	12,000
Diatomite e/		200	180	--	--	--
Feldspar (china stone)		6,960	7,000	7,900 r/ e/	8,000 r/ e/	8,000
Fluorspar, all grades 9/		70,285	50,000	55,000 e/	65,000 r/	67,000
Gypsum and anhydrite e/	thousand tons	2,500	2,000	2,000	2,000 r/	2,000
Lime, quicklime and hydrated e/	do.	2,500	2,500	2,500	2,500	2,500
Nitrogen, N content of ammonia	do.	873	1,006	799 r/	849 r/	642 2/
Potash, K_2O equivalent		550,000	580,000	582,000	618,000 r/	565,000
Salt:						
Rock e/	thousand tons	1,200	1,700	1,800	1,800	1,800
From brine e/	do.	1,300	1,300	1,300	1,300	1,300
In brine, sold or used as such	do.	4,080	4,004	3,548	3,512 r/	3,500

See footnotes at end of table.

TABLE 1--Continued
UNITED KINGDOM: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
INDUSTRIAL MINERALS--Continued						
Sand and gravel: e/						
Common sand and gravel	thousand tons	89,500	91,450	101,732	96,377 r/	99,800
Industrial sand	do.	4,000	4,038	4,200 e/	4,816 r/	4,800
Sodium compounds, n.e.s, carbonate e/	do.	1,000	1,000	1,000	1,000	1,000
Stone:						
Crushed:						
Calcite e/	do.	4	3	--	--	--
Chalk	do.	9,076	10,236	9,949	9,239 r/	9,800
Dolomite	do.	17,985	17,616	17,952	16,000	17,000
Igneous rock	do.	57,766	56,494	57,061	50,705 r/	50,500
Limestone	do.	93,727	106,626	94,441	86,342 r/	102,800
Sandstone	do.	16,059	18,974	19,494	17,251 r/	17,500
Slate including fill	do.	462	308	195	325 r/	300
Total e/	do.	195,079	210,257	199,092	179,862 r/	197,900
Dimension: e/						
Igneous	do.	100	100	100	100	100
Limestone	do.	200	200	200	222 r/ 2/	225
Sandstone	do.	200	200	200	271 r/ 2/	275
Slate	do.	61	60	60	83 r/ 2/	85
Strontium minerals		1,000	--	--	--	--
Sulfur, byproduct: e/						
Of metallurgy		61,900	70,500	62,300	44,700 r/	45,000
Of petroleum refining		202,000	162,000	140,000	132,000 r/	160,000
Total		263,900	232,500	202,300	176,700 r/	205,000
Talc, soapstone, pyrophyllite		5,317	5,275	4,298	5,322	5,500
Titania e/ 10/		85,400	85,000	85,000	233 r/	200
MINERAL FUELS AND RELATED MATERIALS						
Coal:						
Anthracite	thousand tons	1,404	1,000	1,000	1,000	1,000
Bituminous including slurries, fines, etc.	do.	66,795	47,971	52,630	50,515	46,981 2/
Lignite	do.	2	2	2	2	2
Total	do.	68,201	48,973	53,632	51,517	47,983
Coke:						
Metallurgical		6,030	6,164	6,187	6,220	6,178 2/
Breeze, all types		61	38	41	40	44
Fuel briquets, all grades e/		1,000	1,034	841	796	814 2/
Gas, natural:						
Marketable 11/	million cubic meters	65,500	69,700	75,461	89,900	91,800
Marketed 12/	do.	52,800	57,200	62,300 e/	65,000	66,000
Natural gas liquids 13/	thousand 42-gallon barrels	40,700	53,200	97,440	80,770 r/	80,890 2/
Peat:	thousand tons	380	500	590	550	500
Petroleum:	thousand 42-gallon barrels					
Crude 14/	do.	749,000	892,740	914,250	914,475 r/	900,915 2/
Refinery products:						
Liquefied petroleum gases	thousand 42-gallon barrels	18,400	20,138	22,597	22,875	24,232 2/
Naphtha including white spirit	do.	23,100	23,900	24,259	25,160 r/	25,000
Gasoline	do.	253,000	234,277	231,660	238,390	249,210 2/
Jet fuel	do.	66,700	61,600	62,696	66,440	66,763 2/
Kerosene	do.	20,000	22,994	22,661	27,203	25,854 2/
Distillate fuel oil	do.	204,000	202,442	202,681	215,616	214,684 2/
Residual fuel oil	do.	83,000	75,777	73,053	76,450	87,633 2/
Lubricants	do.	8,200	9,072	8,827	7,777	8,617 2/
Bitumen	do.	15,000	15,568	14,902	13,265	13,683 2/
Petroleum coke	do.	3,000	3,735	4,174	5,619 r/	5,600
Petroleum wax	do.	500	503	362	323 r/	325
Unspecified e/	do.	3,500	4,361	30,177	30,590	30,275 2/
Refinery fuel and losses	do.	42,000	42,000	42,000	40,000	35,000
Total e/	do.	740,400	716,367	740,049	769,708 r/	786,876

e/ Estimated. r/ Revised.

1/Table includes data available through June 1998.

2/ Reported figure.

TABLE 1--Continued
UNITED KINGDOM: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

3/ Includes a small quantity of primary lead from domestic concentrate.
4/ Produced entirely from imported bullion and includes the lead content of alloys.
5/ Refined nickel and nickel content of ferronickel.
6/ Includes witherite.
7/ Salable product.
8/ Sales, dry weight.
9/ Proportions of grades not available; probably about two-thirds acid grade.
10/ Sales.
11/ Methane, excluding gas flared or reinjected.
12/ Marketable methane, excluding that used for drilling, production, and pumping operations.
13/ Includes ethane, propane, butane, and condensates.
14/ Excludes gases and condensates.

TABLE 2
UNITED KINGDOM: VALUE OF SELECTED MINERAL COMMODITIES e/
(Million dollars1/)

Mineral	1992	1993	1994	1995	1996
Ball clay	47	56	64	69	72
Chalk	61	61	71	72	78
China clay (kaolin)	343	370	367	384	364
Fluorspar	14	14	11	10	13
Fuller's earth	23	24	19	19	23
Gypsum and Anhydrite	29	29	29	32	37
Limestone and Dolomite	782	826	960	995	964
Potash	109	114	134	135	155
Salt	79	82	100	303	309
Silica sand	58	58	64	93	95

e/ Estimate.
1/ Value has been converted from pounds sterling (£) to U.S. dollars ($) at the rate of £1.00 =US$1.67, the average rate during 1997.

Source: British Geological Survey, United Kingdom Minerals Yearbook 1997.

TABLE 3
UNITED KINGDOM: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aggregate	ARC Ltd. (Hanson Plc., 100%) Foster Yoeman Ltd.	50 quarries in various locations	50,000
		Glensanda quarry at Oban	15,000
Aluminum, primary	British Alcan Aluminium Ltd.	Fort William, Kinlochleven, and Lynemouth	175
Do.	Anglesy Aluminium Ltd. (Rio Tinto Corp. 51%; Kaiser Aluminum and Chemical Corp., 49%)	Holyhead, Wales	113
Aluminum, secondary	Trent Alloys Ltd. (Cookson Group, 100%)	North Cave, Humberside	30
Do.	Deeside Aluminium Ltd.	Clwyd, Wales	45
Ball clay	Watts, Blake, Bearne & Co. Plc.	Various operations in northern and southern Devon	500
Celestite	Bristol Minerals Co. Ltd.	Yate, Avon	30
Cement	Aberthaw and Bristol Channel Portland Cement Co. Ltd	East Aberthaw and Rhoose, Glamorgan	1,000
Do.	Blue Circle Industries PLC	Main plants at Couldon, Dunbar, Hope, Northfleet, Weardale, and Westbury	11,000
Do.	Castle Cement Ltd. (Aker Norcem AS, 50%; Indus AB Euroc, 50%;	Main plants at Ketton, Ribblesdale, Pades, and Pitstone	4,000
China clay (kaolin)	ECC Group Plc.	Mines and plants in Devonshire and Dorsetshire	3,000
Coal	RJB Mining Plc.	19 mines in various locations	40 1
Copper	IMI Refiners Ltd.	Refinery at Walsall, West Midlands	80
Ferroalloys	British Steel Plc.	Teesside, Cleveland	80
Do.	Murex Ltd.	Rainham, Essex	25
Do.	London and Scandinavian Metallurgical Co. Ltd.	Rotherham, South Yorkshire	30
Fluorspar	Weadale Fluorspar Ltd.	Mines in Derbyshire	50
Do.	Laporte Industries Plc.	Mill at Stoney Middleton, Mines in Derbyshire	70
Gypsum	British Gypsum Ltd.	Mines in Midlands, Cumbria, and Sussex	3,500
Lead, refined	Britania Refined Metals Ltd.	Northfleet, Kent	165
Lead, secondary	H.J. Enthoven and Son Ltd. (Billiton (U.K.) Ltd., 100%)	Darley Dale, Derbyshire	60
Lead, smelter	MIM Holdings (U.K) Ltd.	Avonmouth, Avon	55
Natural gas	Amoco Ltd. British Petroleum Ltd. Esso (U.K.) Ltd., Phillips Petroleum Co. Plc., Shell (U.K.) Ltd.	North Sea gasfields	1,250 2
Nickel, refined	INCO Europe Ltd. (INCO Ltd., Canada)	Clydach, Wales	30
Petroleum, crude	Amoco Ltd., British Petroleum Ltd., Chevron Ltd., Esso (U.K.) Ltd., Occidental Petroleum Co. Ltd., Shell (U.K.) Ltd., Texaco, Unocal, Inc.	North Sea oilfields	2.1 3
Petroleum, refined	British Petroleum Ltd., Conoco Ltd., Mobil Oil Co. Ltd., and others	11 refineries in various locations	2.3 3
Platinum-group metals	Johnson Matthey Plc.	Enfield (London) and Royston, Cambridgeshire	20
Potash	Cleveland Potash Ltd.	Boulby Mine, Yorkshire	500
Salt, rock	Imperial Chemical Industries Plc.	Mines at Winsford, Cheshire	3,000
Do.	Irish Salt Mining and Exploration Co.	Carrick Fergus, Northern Ireland	300
Sand and gravel	TMC Pioneer Aggregates Ltd.	Chelmsford, Essex	1,000,000
Silica, sand	Hepworth Minerals and Chemicals Ltd.	Operations in Cambridgeshire, Cheshire, Humberside, and Norfolk	6,000
Slate, roofing	Alfred McAlpine Slate Ltd.	Penrhyn quarry, Bethesda, North Wales	25
Steel	British Steel Plc.	4 intergrated steelworks in Gwent, Lanark, South Humberside, and Cleveland	18,000
Talc	Alex Sandison and Son Ltd.	Unst, Shetland Islands	15
Do.	Shetland Talc Ltd. (Anglo European Minerals Ltd., 50%; Dalriada Mineral Ventures Ltd. 50%	Cunningsburg, Shetland Islands	35
Tin, ore	Carnon Consolidated Tin Mines Ltd.	South Crofty Mine, Cornwall	1,800
Titanium, sponge	Deeside Titanium Ltd.	Plant at Deeside, Clyde	5
Zinc, smelter	MIM Holdings (U.K.) Ltd.	Avonmouth, Avon	120

1/ Million metric tons.

2/ Billion cubic feet per year.

3/ Million 42-gallon barrels per day.

TABLE 4
UNITED KINGDOM: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
METALS				
Akali and akaline-earth metals:				
Alkali metals		1,614	4	France 1,068; Netherlands 378; Germany 46.
Alkaline-earth metals		52	6	Switzerland 19; Brunei 4; Japan 3.
Aluminum:				
Ore and concentrate		6,189	4,273	Sweden 711; Denmark 386; France 277.
Oxides and hydroxides		22,202	3,200	Sweden 7,323; Germany 2,745; South Africa 2,296.
Metal including alloys:				
Scrap		100,021	13,487	Italy 11,753; France 8,608; Germany 8,484.
Unwrought		205,280	11,386	Germany 114,837; France 12,222; Netherlands 9,758.
Semimanufactures		302,286	20,964	Germany 61,374; Italy 49,290; Netherlands 28,113.
Antimony, metal including alloys, all forms		162	19	Romania 62; Japan 20; Spain 19.
Beryllium, metal including alloys, all forms		30	4	South Africa 17; Japan 3; Brazil 2.
Bismuth, metal including alloys, all forms		818	182	Germany 99; France 89; Netherlands 70.
Cadmium, metal including alloys, all forms		191	(2/)	Netherlands 61; Italy 59; France 23.
Chromium:				
Ore and concentrate		881	(2/)	Sweden 564; Denmark 254; France 21.
Metal including alloys, all forms		3,206	1,356	Sweden 322; India 223; Japan 213.
Cobalt:				
Ore and concentrate		1	--	Mainly to Republic of Korea.
Oxides and hydroxides		1,118	113	Belgium-Luxembourg 180; Spain 153; Germany 117.
Metal including alloys, all forms		2,348	523	Japan 299; France 284; Germany 256.
Columbium and tantalum:				
Ore and concentrate 3/		18	(2/)	Mainly to Ireland.
Tantalum metal including alloys, all forms		319	43	Czech Republic 170; Hong Kong 48; Japan 45.
Copper:				
Ore and concentrate		20	--	Canada 12; Norway 6; Switzerland 1.
Matte and speiss including cement copper		1,051	--	Belgium-Luxembourg 958; Germany 90; Tanzania 2.
Metal including alloys:				
Scrap		114,752	1,173	Belgium-Luxembourg 20,463; Germany 18,318; Italy 15,882.
Unwrought		32,043	1,274	France 6,159; Italy 4,817; Germany 4,195.
Semimanufactures		220,537	5,983	Ireland 30,817; Germany 26,708; France 22,085.
Germanium, metal including alloys, all forms		11	5	Mainly to Russia.
Gold:				
Waste and sweepings	value, thousands	$3,839	--	Belgium-Luxembourg $2,781; Germany $664; Netherlands $320.
Metal including alloys, unwrought and partly wrought	kilogram	69,386	--	Spain 55,461; Germany 5,238; Greece 3,295.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite		840	21	Germany 318; Brazil 147; Angola 103.
Pyrite, roasted		29	--	Belgium-Luxembourg 24; Switzerland 5.
Metal:				
Scrap	thousand tons	3,416	89	Spain 1,445; Turkey 710; India 321.
Pig iron, cast iron, related materials		69,152	2,274	Germany 8,339; Belgium-Luxembourg 5,527; Sweden 5,331.
Ferroalloys:				
Ferrochromium		2,951	106	Belgium-Luxembourg 830; Netherlands 612; Germany 345.
Ferromanganese		2,844	114	Switzerland 909; Argentina 524; Belgium-Luxembourg 500.
Ferronickel		218	--	Netherlands 217; Spain 1.
Ferrosilicochromium		17	--	Finland 15; Turkey 2.
Ferrosilicomanganese		231	20	France 173; Australia 21; Norway 17.
Ferrosilicon		4,583	52	Germany 920; Japan 860; Ireland 480.
Silicon metal 4/		1,324	596	Germany 227; Belgium-Luxembourg 97; France 69.
Unspecified		29,961	8,374	France 3,991; Germany 3,458; Italy 2,734.
Steel, primary forms	thousand tons	1,193	341	Sweden 333; Germany 135; Greece 89.

See footnotes at end of table.

TABLE 4--Continued
UNITED KINGDOM: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

			Destinations	
Commodity		Total	United States	Other (principal)
METALS--Continued				
Iron and steel--Continued:				
Metal--Continued:				
Semimanufactures--Continued:				
Flat-rolled products--Continued:				
Of iron or nonalloy steel--Continued:				
Not clad, plated, coated	do.	1,920	56	Germany 299; Spain 259; France 152.
Clad, plated, coated	do.	1,183	25	Germany 163; Spain 126; Ireland 112.
Of alloy steel		335,197	35,266	Germany 67,741; Italy 44,775; Sweden 23,722.
Bars, rods, angles, shapes, sections	thousand tons	3,566	278	Germany 577; Belgium-Luxembourg 326; Ireland 229
Rails and accessories		180,538	1,512	Egypt 52,530; India 13,152; Hong Kong 11,759.
Wire		174,667	10,755	Germany 19,657; Ireland 12,958; France 11,870.
Tubes, pipes, fittings		834,913	30,063	Norway 121,161; Germany 92,816; Ireland 62,652.
Lead:				
Ore and concentrate		141	1	Switzerland 64; Austria 41; United Arab Emirates 13
Oxides		2,993	309	Australia 417; Canada 407; Italy 251.
Metal including alloys:				
Scrap		9,973	48	Ireland 5,124; France 2,292; Italy 1,193.
Unwrought		102,713	173	France 21,795; Germany 21,631; Netherlands 9,691
Semimanufactures		12,040	52	Germany 4,191; Belgium-Luxembourg 3,176; Italy 1,334.
Magnesium, metal including alloys:				
Scrap		119	--	Norway 91; Russia 20; Ireland 6.
Unwrought		1,900	254	Germany 778; Norway 202; Canada 129.
Semimanufactures		1,292	4	Belgium-Luxembourg 437; Germany 398; India 94.
Manganese:				
Ore and concentrate, metallurgical-grade		287	(2/)	France 116; Italy 63; Malaysia 36.
Oxides and hydroxides		488	9	Egypt 80; Ireland 77; Germany 62.
Metal including alloys, all forms		1	--	All to Portugal.
Mercury		110	(2/)	New Zealand 103; Brazil 2; Ghana 2.
Molybdenum:				
Ore and concentrate:				
Roasted		1,825	78	Germany 695; Belgium-Luxembourg 414; France 115.
Unroasted		134	(2/)	Mexico 41; Comoros 21; Australia 20.
Metal including alloys:				
Unwrought including waste and scrap		145	27	Belgium-Luxembourg 14; Portugal 5; Switzerland 3.
Semimanufactures		94	10	Brazil 20; Italy 14; Turkey 8.
Nickel:				
Ore and concentrate		46	12	Netherlands 23; India 4; Slovenia 3.
Matte and speiss		219	25	Thailand 109; Germany 11; Mexico 10.
Metal including alloys:				
Scrap		4,620	1,149	Sweden 1,390; Canada 805; Netherlands 321.
Unwrought		26,050	1,634	Belgium-Luxembourg 10,954; Sweden 4,393; Japan 1,854.
Semimanufactures		15,094	1,672	Japan 3,577; France 1,979; Germany 1,733.
Platinum-group metals:				
Waste and sweepings	value, thousands	$22,235	$13,322	Italy $3,113; Japan $2,774; Germany $1,320.
Metal including alloys, unwrought and partly wrought	do.	$518,535	$168,251	Germany $70,580; France $59,292; Japan $47,802.
Silver:				
Ore and concentrate	do.	$42	$3	Hong Kong $25; Belgium-Luxembourg $6; Malta $4
Metal including alloys, unwrought and partly wrought	do.	$522,972	$594	Switzerland $192,386; United Arab Emirates $133,160; Italy $60,674.
Tin:				
Ore and concentrate		3,667	--	Thailand 1,556; Russia 1,066; India 529.
Metal including alloys:				
Scrap		4,246	59	India 1,775; Bangladesh 1,369; Belgium-Luxembourg 659.
Unwrought		2,236	357	Ireland 414; Spain 317; Italy 124.
Semimanufactures		2,964	48	India 1,942; Bangladesh 241; Pakistan 202.

See footnotes at end of table.

TABLE 4--Continued
UNITED KINGDOM: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
METALS--Continued				
Titanium:				
Ore and concentrate		24	--	France 12; Netherlands 11; Ireland 1.
Oxides		9,281	2,143	France 1,585; Netherlands 877; Germany 569.
Metal including alloys:				
Unwrought including waste and scrap		6,764	3,990	Republic of Korea 1,210; Germany 661; Canada 175.
Semimanufactures		3,979	1,777	France 1,072; Germany 297; Israel 242.
Tungsten:				
Ore and concentrate	value, thousands	$11	$4	Norway $7.
Metal including alloys:				
Unwrought including waste and scrap		1,005	245	Germany 393; Canada 133; Sweden 47.
Semimanufactures		133	41	Canada 18; Japan 18; Malaysia 9.
Uranium and thorium, metal including all alloys, all forms:				
Uranium	value, thousands	$78,975	--	Unspecified countries.
Thorium	do.	$3,192	$15	Russia $170; Germany $75; France $42.
Vanadium: Metal including alloys, all forms		7	(2/)	Netherlands 5; Republic of Korea 2.
Zinc:				
Ore and concentrate		29	3	Singapore 14; Norway 7; Macau 2.
Oxides		8,290	126	Germany 2,496; Ireland 981; France 900.
Metal including alloys:				
Scrap		26,593	900	Hong Kong 3,498; India 2,336; Germany 2,317.
Unwrought		33,860	161	Germany 6,298; France 4,019; Hong Kong 3,378.
Semimanufactures 5/		8,655	53	France 2,991; South Africa 945; Czech Republic 613.
Zirconium:				
Ore and concentrate		2,596	37	Indonesia 1,780; Italy 146; Portugal 120.
Metal including alloys:				
Unwrought including waste and scrap		415	23	Malaysia 229; Saudi Arabia 120; Israel 20.
Semimanufactures		256	2	Iran 200; United Arab Emirates 23; Norway 5.
Other:				
Ores and concentrates		30	--	Switzerland 15; Thailand 15.
Oxides and hydroxides		1,641	279	Italy 310; Netherlands 202; France 140.
Ashes and residues		40,786	1,291	Belgium-Luxembourg 13,864; Sweden 8,976; Canada 8,346.
Base metals including alloys, all forms		190	10	Singapore 65; Germany 36; Tunisia 16.
Metalloids 6/		268	71	Spain 42; Germany 33; France 19.
Precious metals, n.e.s.:				
Ores and concentrates	value, thousands	$446	$9	France $324; Netherlands $77; Canada $20.
Waste and sweepings	do.	$17,874	$1,841	Belgium-Luxembourg $6,604; Sweden 3,628; France $2,371.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural, corundum, emery, pumice, etc.		2,329	26	Spain 557; Italy 292; Thailand 239.
Artificial corundum		22,671	678	Germany 6,118; France 3,632; Netherlands 3,018.
Dust and powder of precious and semiprecious stones including diamonds	value, thousands	$16,530	$4,240	Germany $3,337; Italy $2,126; Ireland $906.
Grinding and polishing wheels and stones		8,637	1,477	Germany 1,511; Japan 985; France 781.
Asbestos, crude		967	(2/)	Germany 577; France 99; Austria 97.
Barite and witherite		5,494	--	Netherlands 656; Republic of Korea 573; Germany 556.
Boron:				
Crude natural borates		2,181	--	France 1,899; Ireland 146; Belgium-Luxembourg 73.
Oxides and acids		143	(2/)	Netherlands 59; Ireland 21; Greece 19.
Bromine, fluorine, iodine		5,344	5	Japan 1,762; Germany 1,498; Belgium-Luxembourg 851.
Cement		619,957	941	Norway 61,542; Netherlands 42,403; Denmark 42,169.
Chalk		35,483	72	Germany 12,118; Ireland 7,332; Belgium-Luxembourg 2,196.
Clays, crude:				
Bentonite		83,783	1,807	Sweden 13,781; Germany 12,909; Finland 10,373.
Kaolin	thousand tons	3,199	15	Finland 766; Belgium-Luxembourg 284; Italy 280.
Unspecified		52,139	1,178	Germany 13,955; Netherlands 5,265; Finland 3,732.

See footnotes at end of table.

TABLE 4--Continued
UNITED KINGDOM: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
INDUSTRIAL MINERALS--Continued				
Cryolite and chiolite		198	79	France 114; Ireland 3; Trinidad and Tobago 2.
Diamond, natural:				
Gem, not set or strung	value, millions	$5,089	$284	Belgium-Luxembourg $2,545; India $768; Switzerland $660.
Industrial stones	value, thousands	$38,808	$16,588	Belgium-Luxembourg $11,532; Ireland $3,106; Germany $2,305.
Diatomite and other infusorial earth		2,608	7	Indonesia 946; Croatia 299; South Africa 239
Feldspar		249	--	Ireland 99; Italy 73; Trinidad and Tobago 50.
Fertilizer materials:				
Crude, n.e.s.		7,840	14	Ireland 3,019; Belgium-Luxembourg 1,704; Netherlands 893.
Manufactured:				
Ammonia		142,368	7	France 60,957; Spain 39,926; Netherlands 24,159
Nitrogenous		175,154	212	France 114,043; Australia 16,769; Spain 13,687
Phosphatic		527	127	Australia 131; Spain 127; Norway 63.
Potassic		3,583	140	Ireland 623; Romania 616; Australia 492.
Unspecified and mixed		357,610	939	Ireland 304,909; Italy 8,398; Norway 7,484.
Fluorspar		7,091	--	Sweden 2,388; Poland 1,114; Turkey 889.
Graphite, natural		9,771	68	Italy 8,111; Germany 387; South Africa 265.
Gypsum and plaster		26,985	429	Ireland 7,694; Hong Kong 7,688; Italy 1,225.
Lime		50,975	--	Ireland 12,729; France 6,697; Cote d' Ivoire 6,362.
Magnesium compounds:				
Magnesite, crude		270	--	Ireland 193; Poland 25; South Africa 21.
Oxides and hydroxides		64,727	--	Unspecified countries 59,918; Ireland 2,941; Sweden 854.
Mica:				
Crude including splittings and waste		5,220	87	Germany 2,300; Israel 390; Italy 384.
Worked including agglomerated splittings		289	17	Germany 125; South Africa 28; France 22.
Nitrates, crude		100	13	Ireland 26; Peru 20; Oman 18.
Phosphates, crude		2,505	16	Thailand 1,197; Congo 527; Netherlands 323.
Pigments, mineral, iron oxides and hydroxides, processed		24,808	2,807	Belgium-Luxembourg 3,782; France 2,651; Germany 2,435.
Potassium salts, crude		11	10	Hungary 1.
Precious and semiprecious stones other than diamond:				
Natural	value, thousands	$43,260	$6,851	Switzerland $15,942; France $4,678; India $2,776.
Synthetic	do.	$800	$106	France $176; Germany $159; Netherlands $141.
Pyrite, unroasted		1,488	55	Hong Kong 545; Thailand 198; Saudi Arabia 195.
Quartz crystal, piezoelectric	value, thousands	$271	$82	Thailand $118; Italy $24; Brazil $22.
Salt and brine		453,988	82,461	Sweden 90,482; Ireland 68,858; Denmark 48,218.
Sodium compounds, n.e.s.:				
Soda ash, manufactured		4,710	--	Unspecified.
Sulfate, manufactured		28,882	9	Colombia 18,911; Italy 5,923; South Africa 1,583
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked		3,929	271	Ireland 1,976; Belgium-Luxembourg 671; Canada 374.
Worked		17,649	1,993	Ireland 4,205; Japan 1,796; Netherlands 1,265.
Dolomite, chiefly refractory-grade		87,992	24	Denmark 52,405; Germany 18,142; Ireland 6,132.
Gravel and crushed rock	thousand tons	11,205	(2/)	Netherlands 4,965; Belgium-Luxembourg 2,428; France 1,824.
Limestone other than dimension		551,794	4,339	Belgium-Luxembourg 239,721; Denmark 90,192; Norway 79,332.
Quartz and quartzite		987	11	Egypt 220; Hong Kong 35; France 26.
Sand other than metal-bearing		689,953	1,644	France 469,096; Ireland 126,046; Norway 33,994.
Sulfur:				
Elemental:				
Crude including native and byproduct		1,946	(2/)	Tunisia 720; Germany 391; Ireland 190.
Colloidal, precipitated, sublimed		4,965	1	France 2,704; Germany 1,166; Nigeria 921.
Dioxide		191	(2/)	Ireland 118; Thailand 32; Jordan 11.

See footnotes at end of table.

TABLE 4--Continued
UNITED KINGDOM: EXPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Destinations	
			United States	Other (principal)
INDUSTRIAL MINERALS--Continued				
Sulfur--Continued:				
Sulfuric acid		138,397	7,874	Ireland 42,239; Netherlands 32,001; Portugal 22,093.
Talc, steatite, soapstone, pyrophyllite		3,207	1	Belgium-Luxembourg 1,007; Ireland 818; France 279.
Vermiculite, perlite, chlorite		2,650	--	France 766; Ireland 540; Singapore 260.
Other:				
Crude		27,500	2,606	Turkey 5,768; Iran 2,925; Spain 2,073.
Slag and dross, not metal-bearing		64,579	1,692	Ireland 17,550; Germany 9,227; Indonesia 7,416.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural		58,051	--	Norway 26,576; Iceland 11,545; Netherlands 6,731.
Carbon, black		45,328	489	France 17,813; Germany 6,494; Belgium-Luxembourg 5,034.
Coal:				
Anthracite		389,306	214	Ireland 152,829; Belgium-Luxembourg 90,314; France 60,358.
Bituminous		594,115	--	Ireland 326,108; France 98,940; Norway 63,364.
Briquets of anthracite and bituminous coal		119,204	--	Norway 55,803; France 25,128; Venezuela 23,810.
Lignite including briquets		2,095	159	Ireland 1,724; Italy 54; France 47.
Unspecified		5,063	--	Norway 2,883; Ireland 1,308; Denmark 803.
Coke and semicoke		245,114	74	Norway 177,629; Sweden 38,672; Ireland 12,300.
Gas:				
Manufactured		21	--	Argentina 20; Hong Kong 1.
Natural:				
Gaseous		956,274	--	Netherlands 563,938; Ireland 392,262; Sweden 74.
Liquefied		79,443	--	Norway 76,421; Netherlands 1,462; Belgium-Luxembourg 903.
Peat including briquets and litter		81,589	406	Ireland 32,269; Sweden 24,779; Canada 6,773.
Petroleum:				
Crude	thousand tons	76,484	19,096	France 14,499; Germany 14,485; Netherlands 14,248.
Refinery products:				
Liquefied petroleum gas	do.	3,457	12	France 1,074; Netherlands 555; Portugal 546.
Gasoline	do.	8,868	3,547	Netherlands 929; France 752; Belgium-Luxembourg 751.
Mineral jelly and wax		34,157	162	Belgium-Luxembourg 5,086; France 4,123; Ireland 3,726.
Kerosene and jet fuel		783,317	3	Ireland 449,680; Sweden 80,500; Denmark 57,414.
Distillate fuel oil	thousand tons	5,017	--	Unspecified countries 4,597; Ireland 203; Poland 84.
Lubricants	do.	1,364	5	Italy 198; Germany 145; Netherlands 142.
Residual fuel oil	do.	4,858	219	Unspecified countries 4,111; Germany 367; Belgium-Luxembourg 92.
Bitumen and other residues		58,743	--	Unspecified countries 44,676; Spain 11,235; Germany 2,023.
Bituminous mixtures		91,433	39	Ireland 73,159; Norway 3,038; Sweden 1,647.
Petroleum coke		651,555	--	Unspecified countries 588,558; Spain 59,072; Ireland 1,938.

1/ Table prepared by Glenn J. Wallace.

2/ Less than 1/2 unit.

3/ May include vanadium.

4/ May include high-purity silicon.

5/ Includes zinc dust, flakes, and powders.

6/ Reported under SITC item number as "selenium, tellurium, phosphorus, arsenic, etc."

Source: United Nations Statistical Office (microfiche).

TABLE 5

UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Sources	
			United States	Other (principal)
METALS				
Akali and akaline-earth metals:				
Alkali metals		13,317	608	Germany 12,651; China 17; France 17.
Alkaline-earth metals		529	216	China 148; France 104; Hong Kong 24.
Aluminum:				
Ore and concentrate		317,885	391	Ghana 251,586; China 42,250; Australia 20,214
Oxides and hydroxides		605,176	2,689	Ireland 298,295; Jamaica 174,164; Spain 59,947.
Metal including alloys:				
Scrap		84,138	3,184	Germany 17,943; Russia 15,024; Ireland 11,061
Unwrought		653,109	12,654	Russia 339,399; Norway 101,047; Canada 34,726
Semimanufactures		409,854	27,239	Germany 109,198; France 73,113; Norway 32,348
Antimony, metal including alloys, all forms		2,171	(2/)	China 1,810; Hong Kong 101; Kyrgyzstan 99.
Beryllium, metal including alloys, all forms		20	4	Germany 15; China 1.
Bismuth, metal including alloys, all forms		761	12	Belgium-Luxembourg 245; Peru 169; China 165.
Cadmium, metal including alloys, all forms		344	(2/)	Finland 115; Canada 100; Belgium-Luxembourg 75.
Chromium:				
Ore and concentrate		176,179	--	South Africa 174,405; United Arab Emirates 1,379; Netherlands 330.
Oxides and hydroxides		1,753	88	Russia 1,078; France 323; Germany 123.
Metal including alloys, all forms		1,171	105	France 351; China 246; Russia 232.
Cobalt:				
Ore and concentrate		2	--	All from Netherlands.
Oxides and hydroxides		707	8	Finland 147; France 49; Netherlands 18.
Metal including alloys, all forms		3,743	551	Netherlands 726; Russia 504; South Africa 432.
Columbium and tantalum:				
Ore and concentrate 3/		37	37	
Tantalum metal including alloys, all forms		984	52	Czech Republic 750; Germany 71; Japan 37.
Copper:				
Ore and concentrate		336	24	Netherlands 136; Germany 134; Ireland 21.
Matte and speiss including cement copper		44	--	Italy 17; South Africa 16; Sweden 6.
Metal including alloys:				
Scrap		47,925	1,590	Finland 8,151; Russia 7,891; South Africa 3,963
Unwrought		338,052	5,313	Chile 92,297; Canada 50,550; Russia 49,302.
Semimanufactures		177,702	3,141	Germany 51,744; France 31,932; Italy 18,243.
Germanium, metal including alloys, all forms		16	3	Russia 6; France 5; Belgium-Luxembourg 1.
Gold:				
Waste and sweepings	value, thousands	$15,496	--	France $4,268; Ireland $3,770; Belgium-Luxembourg $3,395.
Metal including alloys, unwrought and partly wrought	kilograms	21,500	--	France 14,835; Belgium-Luxembourg 3,965; Germany 1,293.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	thousand tons	20,304	(2/)	Australia 7,693; Canada 4,404; South Africa 2,750.
Pyrite, roasted		3,555	--	Germany 3,554; Belgium-Luxembourg 1.
Metal:				
Scrap		227,472	7,503	Germany 71,635; Norway 69,857; Russia 29,872
Pig iron, cast iron, related materials		242,703	1,058	Latvia 100,472; Russia 30,272; Canada 29,792.
Ferroalloys:				
Ferrochromium		101,575	14	South Africa 59,249; Zimbabwe 12,620; Norway 11,467.
Ferromanganese		131,580	2,504	Norway 78,383; South Africa 31,222; Netherlands 8,023.
Ferronickel		35,498	63	Estonia 8,302; New Caledonia 6,405; France 6,084.
Ferrosilicomanganese		37,423	--	Norway 16,943; Netherlands 6,948; Italy 5,869.
Ferrosilicon		97,755	18	Norway 63,119; Egypt 3,598; Poland 2,532.

See footnotes at end of table.

TABLE 5--Continued
UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Sources	
			United States	Other (principal)
METALS--Continued				
Iron and steel--Continued:				
Metal--Continued:				
Ferroalloys--Continued:				
Silicon metal 4/		46,805	63	Norway 15,563; South Africa 11,760; France 8,687.
Unspecified		25,818	5,187	Russia 5,184; Norway 4,708; China 2,757.
Steel, primary forms		368,557	4,975	Netherlands 87,253; Russia 54,206; Germany 46,097.
Semimanufactures:				
Flat-rolled products:				
Of iron or nonalloy steel:				
Not clad, plated, coated	thousand tons	1,767	2	Germany 341; Belgium-Luxembourg 221; Netherlands 218.
Clad, plated, coated	do.	1,168	23	Germany 264; France 244; Netherlands 186.
Of alloy steel		749,325	3,534	Germany 294,163; Sweden 287,291; France 60,740
Bars, rods, angles, shapes, sections	thousand tons	1,242	9	Germany 288; Spain 192; France 115.
Rails and accessories		30,428	287	Belgium-Luxembourg 18,371; Austria 3,029; Sweden 2,301.
Wire		101,374	1,767	Belgium-Luxembourg 23,727; Germany 12,341; Italy 10,800.
Tubes, pipes, fittings		818,757	27,632	Germany 178,126; Italy 130,946; France 106,444.
Lead:				
Ore and concentrate		6,648	–	Sweden 6,599; Germany 49.
Oxides		3,075	553	Germany 1,312; Netherlands 795; France 110.
Metal including alloys:				
Scrap		12,493	–	Germany 3,020; Lebanon 2,253; Belgium-Luxembourg 1,696.
Unwrought		186,433	5,022	Australia 152,706; Russia 16,698; Canada 3,258.
Semimanufactures		26,870	65	Ireland 11,639; Sweden 7,849; Belgium-Luxembourg 4,379.
Magnesium, metal including alloys:				
Scrap		3,154	24	Netherlands 807; Germany 742; Nigeria 417.
Unwrought		7,226	383	Netherlands 2,486; Norway 1,466; Canada 631.
Semimanufactures		1,423	653	Italy 222; Germany 160; Netherlands 91.
Manganese:				
Ore and concentrate, metallurgical-grade		40,306	244	Brazil 36,920; Macau 1,800; Australia 1,000.
Oxides and hydroxides		5,834	107	Norway 2,673; South Africa 1,278; Spain 516.
Metal including alloys, all forms		7,393	364	China 4,027; South Africa 1,925; Australia 226.
Mercury		4	4	
Molybdenum:				
Ore and concentrate:				
Roasted		12,720	8,853	China 1,673; Hong Kong 1,034; Netherlands 478.
Unroasted		4,137	637	Chile 2,036; China 1,096; Hong Kong 300.
Metal including alloys:				
Unwrought including waste and scrap		658	118	Germany 290; Austria 169; Russia 28.
Semimanufactures		184	81	Germany 50; Austria 21; France 14.
Nickel:				
Ore and concentrate		74	–	Germany 52; Belgium-Luxembourg 10; Netherlands 10.
Matte and speiss		63,833	13	Canada 61,797; Netherlands 1,482; Australia 390.
Metal including alloys:				
Scrap		14,557	1,465	Turkey 3,229; South Africa 1,825; Israel 1,340.
Unwrought		18,715	417	Norway 6,455; Australia 4,439; Russia 2,527.
Semimanufactures		7,887	3,463	Germany 1,480; Canada 663; Italy 441.
Platinum-group metals:				
Waste and sweepings	value, thousands	$306,906	$48,087	France $43,822; Germany $39,401; Lithuania $33,634.
Metal including alloys, unwrought and partly wrought	do.	$296,542	$69,268	South Africa $76,899; Switzerland $41,618; Russia $28,753.

See footnotes at end of table.

TABLE 5--Continued
UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Sources: United States	Sources: Other (principal)
METALS--Continued				
Silver:				
Ore and concentrate	do.	$541	--	All from Belgium-Luxembourg.
Metal including alloys, unwrought and partly wrought	do.	$515,679	$315,263	Kazakstan $62,883; Mexico $41,298; Poland $19,764.
Tin:				
Ore and concentrate		18	(2/)	Ireland 13; France 4; Netherlands 1.
Metal including alloys:				
Scrap		557	318	United Arab Emirates 105; Finland 72; Estonia 17.
Unwrought		11,823	425	Malaysia 2,797; China 1,503; Indonesia 1,265
Semimanufactures		1,087	120	Belgium-Luxembourg 299; Ireland 146; France 121.
Titanium:				
Ore and concentrate		239,987	(2/)	Australia 200,851; Canada 23,335; Norway 15,575
Oxides		7,927	2,358	Poland 1,896; Belgium-Luxembourg 773; Czech Republic 639.
Metal including alloys:				
Unwrought including waste and scrap		16,279	4,265	Japan 4,359; Russia 4,354; Netherlands 1,132.
Semimanufactures		2,354	1,183	France 356; Italy 258; Russia 124.
Tungsten:				
Ore and concentrate	value, thousands	$3	--	All from Switzerland.
Metal including alloys:				
Unwrought including waste and scrap		1,402	69	Germany 422; Japan 200; Russia 189.
Semimanufactures		192	33	Germany 66; Netherlands 30; Austria 12.
Uranium and thorium:				
Ore and concentrate		4,287	--	Russia 2,486; Australia 1,121; Canada 408.
Metal including all alloys, all forms:				
Uranium	value, thousands	$37,308	--	All from unspecified countries.
Thorium	do.	$6,746	$3,478	Germany $2,095; Portugal $708; Netherlands $142.
Vanadium, metal including alloys, scrap		369	95	Austria 103; Japan 67; Germany 51.
Zinc:				
Ore and concentrate		154,230	12,426	Peru 48,546; Australia 26,403; Bolivia 19,486.
Oxides		11,476	111	Peru 2,581; Netherlands 1,635; India 1,493.
Metal including alloys:				
Scrap		2,971	84	Germany 625; Netherlands 508; Belgium-Luxembourg 422.
Unwrought		136,128	38	Finlanf 51,649; Norway 44,591; Netherlands 21,994.
Semimanufactures 5/		3,384	97	Germany 1,125; France 746; Belgium-Luxembourg 595.
Zirconium:				
Ore and concentrate		57,432	815	South Africa 33,943; Australia 17,014; Netherlands 2,997.
Metal including alloys:				
Unwrought including waste and scrap		415	23	Malaysia 229; Saudi Arabia 120; Israel 20.
Semimanufactures		171	54	France 101; Italy 11; Belgium-Luxembourg 2.
Other:				
Ores and concentrates		131,537	(2/)	Australia 80,078; Turkey 34,367; Peru 11,914.
Oxides and hydroxides		9,952	2,537	Germany 2,031; Norway 1,262; France 826.
Ashes and residues		50,023	1,268	Germany 23,812; Denmark 12,733; Belgium-Luxembourg 3,504.
Base metals including alloys, all forms		159	9	Germany 56; France 17; Estonia 16.
Metalloids 6/		1,023	19	Austria 137; France 103; Russia 99.
Precious metals, n.e.s.:				
Ores and concentrates	value, thousands	$159,626	$4,534	Canada $68,619; South Africa $35,543; Chile $26,375.
Waste and sweepings	do.	$71,407	$12,441	Canada $16,081; Lithuania $8,382; France $5,239

See footnotes at end of table.

TABLE 5--Continued
UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Sources	
			United States	Other (principal)
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.		10,272	1,360	Turkey 2,998; Italy 2,326; Netherlands 1,254.
Artificial corundum		60,327	–	France 16,059; Austria 3,841; Germany 2,755.
Dust and powder of precious and semiprecious stones including diamonds	value, thousands	$18,761	$3,277	Ireland $6,223; Israel $3,958; Belgium-Luxembourg $2,629.
Grinding and polishing wheels and stones		67,143	264	Ireland 58,428; Italy 1,803; Germany 1,388.
Asbestos, crude		7,099	20	Canada 6,134; South Africa 602; Zimbabwe 342.
Barite and witherite		84,937	–	Spain 6,215; Germany 3,235; unspecified 74,882.
Boron:				
Crude natural borates		28,032	280	Turkey 27,382; Belgium-Luxembourg 343; Germany 19.
Oxides and acids		12,218	2	France 4,704; Chile 3,437; Turkey 1,923.
Bromine, fluorine, iodine		10,466	11	Israel 6,464; Belgium-Luxembourg 1,352; Japan 817.
Cement	thousand tons	1,343	1	Greece 576; Ireland 234; Germany 119.
Chalk		42,654	1	Denmark 41,802; Belgium-Luxembourg 397; Greece 328.
Clays, crude:				
Bentonite		168,665	44,364	Cyprus 35,240; Italy 21,649; Denmark 17,537.
Kaolin		48,599	39,012	Netherlands 5,538; France 2,312; Australia 788.
Unspecified		133,305	45,815	France 36,628; South Africa 23,351; Belgium-Luxembourg 7,066.
Cryolite and chiolite		236	–	Germany 110; Norway 72; Denmark 32.
Diamond, natural:				
Gem, not set or strung	value, millions	$5,074	$114	Switzerland $3,351; Belgium-Luxembourg $1,001; South Africa $312.
Industrial stones	value, thousands	$21,465	$514	Belgium-Luxembourg $7,926; Russia $2,668; Israel $2,430.
Diatomite and other infusorial earth		16,145	7,986	Iceland 3,161; France 2,262; Germany 1,803.
Feldspar		28,220	–	Norway 13,300; Sweden 7,962; Finland 6,107.
Fertilizer materials:				
Crude, n.e.s.		16,595	29	France 11,132; Ireland 4,910; Belgium-Luxembourg 224.
Manufactured:				
Ammonia		92,079	34	Russia 48,099; Poland 15.962; Netherlands 14,794.
Nitrogenous	thousand tons	2,160	2	Russia 543; Netherlands 451; Germany 250.
Phosphatic		329,691	–	Morocco 148,5768; Tunisia 94,353; Poland 34,182
Potassic		471,754	13	Germany 296,214; Canada 66,310; Israel 48,780
Unspecified and mixed		947,188	1,420	Norway 261,536; Netherlands 119,259; Belgium-Luxembourg 99,653.
Fluorspar		12,584	–	South Africa 5,326; Mexico 4,050; China 1,998.
Graphite, natural		25,446	477	China 7,319; Madagascar 6,137; Norway 3,287.
Gypsum and plaster		683,184	3,121	Spain 508,290; Ireland 77,806; Sweden 28,676.
Lime		8,352	–	Ireland 7,799; Germany 220; Switzerland 181.
Magnesium compounds:				
Magnesite, crude		19,116	264	Turkey 8,470; Germany 4,841; Greece 4,223.
Oxides and hydroxides		155,674	13,810	Australia 30,598; China 28,362; Spain 27,799.
Mica:				
Crude including splittings and waste		16,181	47	China 5,905; India 4,633; Brazil 1,659.
Worked including agglomerated splittings		812	4	Switzerland 297; Belgium-Luxembourg 173; France 142.
Nitrates, crude		4,732	(2/)	Belgium-Luxembourg 4,460; Germany 194; France 77.
Phosphates, crude		27,457	–	Tunisia 17,962; Romania 2,995; Spain 2,600.
Pigments, mineral, iron oxides and hydroxides, processed		48,871	3,120	China 17,747; Germany 11,410; Hong Kong 5,526.
Potassium salts, crude		26,361	–	Germany 25,443; Belgium-Luxembourg 918.

See footnotes at end of table.

TABLE 5--Continued
UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Sources: United States	Sources: Other (principal)
INDUSTRIAL MINERALS--Continued:				
Precious and semiprecious stones other than diamond:				
Natural	value, thousands	$67,540	$8,677	Switzerland $29,029; Thailand $7,129; Germany $4,014.
Synthetic	do.	$3,393	$739	Switzerland $876; Ireland $638; Germany $246
Pyrite, unroasted		99	--	Peru 59; Ireland 20; Norway 20.
Quartz crystal, piezoelectric	value, thousands	$2,692	$1,355	France $781; Japan $486; Switzerland $59.
Salt and brine		311,918	319	Spain 126,452; Germany 61,175; Netherlands 34,810.
Sodium compounds, n.e.s.:				
Soda ash, manufactured		91,260	--	Belgium-Luxembourg 48,625; Netherlands 41,326. Denmark 704.
Sulfate, manufactured		87,082	45	Spain 65,483; Belgium-Luxembourg 7,052; Germany 5,524.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked		429,800	546	Norway 351,375; Ireland 16,537; Portugal 14,475
Worked		113,018	694	Spain 39,514; Italy 20,098; Portugal 17,412.
Dolomite, chiefly refractory-grade		179,157	2,188	Spain 94,993; Norway 67,678; Greece 13,018
Gravel and crushed rock		724,585	1,112	Norway 477,586; Ireland 104,687; France 48,518
Limestone other than dimension		522	72	Ireland 442; Denmark 4; Czech Republic 2.
Quartz and quartzite		2,549	257	Japan 1,008; Brazil 427; Netherlands 156.
Sand other than metal-bearing		262,842	3,766	Germany 181,600; Ireland 26,911; Belgium-Luxembourg 21,260.
Sulfur:				
Elemental:				
Crude including native and byproduct		245,746	189	France 105,590; Germany 103,415; Poland 28,653
Colloidal, precipitated, sublimed		547	20	Germany 328; France 157; India 22.
Dioxide		5,487	--	Sweden 5,255; France 152; Spain 46.
Sulfuric acid		181,608	1	Mainly from unspecified countries.
Talc, steatite, soapstone, pyrophyllite		71,009	8	Finland 15,471; France 14,008; Belgium-Luxembourg 11,631.
Vermiculite, perlite, chlorite		98,307	77	Italy 33,466; Greece 20,984; Turkey 14,800.
Other:				
Crude		343,479	4,731	Norway 255,874; Spain 38,663; France 16,091
Slag and dross, not metal-bearing		486,209	2,576	France 176,392; Belgium-Luxembourg 154,147, South Africa 91,045.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural		920,442	3,272	Venezuela 911,497; Belgium-Luxembourg 2,905; Trinidad and Tobago 2,211.
Carbon black		52,746	6,452	France 17,061; Netherlands 7,188; Germany 6,852
Coal:				
Anthracite	thousand tons	1,151	96	Netherlands 182; Germany 148; Colombia 98.
Bituminous	do.	15,204	2,840	Unspecified countries 6,871; Australia 3,795; Canada 1,421.
Briquets of anthracite and bituminous coal		49,556	113	Germany 33,324; Ireland 9,900; Netherlands 4,896
Lignite including briquets		5,721	209	Germany 2,903; Ireland 2,578; Canada 31.
Unspecified	thousand tons	1,267	550	Colombia 434; South Africa 136; Poland 114.
Coke and semicoke		781,360	18,577	China 477,137; Poland 51,009; Estonia 47,729.
Gas, natural:				
Gaseous	thousand tons	1,044	--	Norway 1,043; Netherlands 1.
Liquefied		8	4	Switzerland 4.
Peat including briquets and litter		194,703	--	Ireland 174,474; Germany 10,085; Lithuania 6,656
Petroleum:				
Crude	thousand tons	40,996	(2/)	Norway 26,701; Algeria 1,746; Nigeria 1,568
Refinery products:				
Liquefied petroleum gas		626,541	9,086	Norway 404,492; Belgium-Luxembourg 51,515, France 41,685.
Gasoline	thousand tons	2,751	1	Norway 853; France 382; Netherlands 275

See footnotes at end of table.

TABLE 5--Continued
UNITED KINGDOM: IMPORTS OF MINERAL COMMODITIES IN 1996 1/

(Metric tons unless otherwise specified)

Commodity		Total	Sources	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS--Continued:				
Petroleum--Continued:				
Refinery products--Continued:				
Mineral jelly and wax		24,964	1,446	Germany 9,010; Netherlands 3,761; France 3,473.
Kerosene and jet fuel	thousand tons	1,456	34	Portugal 206; Netherlands 205; Norway 156.
Distillate fuel oil	do.	1,644	30	Norway 441; Russia 293; France 240.
Lubricants		465,738	10,980	France 136,953; Netherlands 84,472; Sweden 43,195.
Residual fuel oil	thousand tons	8,120	1	Libya 1,322; Sweden 1,062; Belgium-Luxembourg 911.
Bitumen and other residues		109,584	1,139	France 94,095; Netherlands 10,699; Belgium-Luxembourg 2,069.
Bituminous mixtures		31,007	252	France 21,795; Netherlands 6,776; Ireland 1,167.
Petroleum coke	thousand tons	1,074	981	Belgium-Luxembourg 27; Aruba 23; Netherlands 16.

1/ Table prepared by Glenn J. Wallace.

2/ Less than 1/2 unit.

3/ May include vanadium.

4/ May include high-purity silicon.

5/ Includes zinc dust, flakes, and powders.

6/ Reported under SITC item number as "selenium, tellurium, phosphorus, arsenic, etc."

THE MINERAL INDUSTRY OF

UZBEKISTAN

By Richard M. Levine and Walter G. Steblez

Uzbekistan was the third most populous state created from the former Soviet Union (FSU) and the fourth largest in land area. Well endowed with mineral wealth, it was among the world's largest producers of gold, which was a significant source of foreign currency earnings. Gold exploration continued to be an important activity in the country's mineral industry.

Along with gold, Uzbekistan produced a number of other nonferrous metals important to its economy, including copper, lead, molybdenum, silver, tungsten, and zinc, as well as natural gas and uranium. The country also produced steel, coal, and oil and had one of the FSU's largest gas-processing facilities at Mubarek. It also produced significant quantities of industrial minerals, including feldspar and fluorspar, as well as a range of minerals for the construction industry.

Soon after declaring independence in 1991, Uzbekistan established economic policies that differed from more market-oriented approaches taken by several other former Soviet republics. State subsidies, price controls, and gradual wage increases were used to shield consumers from inflation. By 1994, however, mounting economic problems resulted in an economic reform program that included stricter fiscal policies, removing some price controls, cooperating with international financial institutions, introducing the Soum as the new national currency, and privatizing some state assets.

In 1997, Uzbekistan's gross domestic product (GDP) and industrial output increased by 5.2% and 6.5%, respectively, compared with those of 1996. This was the second year in a row that the GDP grew, although industrial output had been increasing each year since 1993. Net changes in the value of production by subsectors of industry from 1996 to 1997 showed the output of ferrous metals declining by 17.1% and that of nonferrous metals increasing by 7.6%. Also, the value of output of the chemical and petrochemical and mineral fuel sectors showed increases of 1.3% and 4.2%, respectively, while those of construction materials and electric power sectors registered declines of 3.4% and 1%, respectively. Uzbekistan's minerals industry achieved the following preliminary production results for selected commodities in 1997. The output of rolled steel amounted to 362,000 metric tons (t), which was a 7% decrease compared with that of 1996. Production of cement and mineral fertilizers amounted to about 3.5 million metric tons (Mt) and 1 Mt, respectively, which were the same levels as in 1996. Production of coal, petroleum and gas condensate, and natural gas amounted to 3.1 Mt, 7.9 Mt, and 51.2 billion cubic meters, respectively, which were slight increases compared with those of 1996. Also, Uzbekistan's output of electric power in 1997 amounted to 45.5 billion kilowatt hours, which was also a slight increase compared with that of 1996 (Interfax News Agency, 1998e).

In 1997, of the total foreign investment in the economy of Uzbekistan, the petroleum refining, natural gas, and nonferrous metals sectors were designated to receive 6.7%, 2.5% and 2.5%, respectively. Foreign investment in 1998 was anticipated to amount to $2.9 billion (Interfax News Agency, 1998e).

The Government's investment program for geologic survey and exploration work for 1998 called for an expenditure of $50 million, about the same amount that was allocated in 1997 (Interfax News Agency, 1998i). According to spokespersons from the State Committee for Geology and Natural Resources, more than one-half of the funds were to be allocated for gold and nonferrous metals prospecting. The State Committee for Geology indicated that declines in the world gold market had not resulted in any waivers of prospecting rights by foreign companies in Uzbekistan, although many of these companies had not yet clearly defined their programs and level of financing for 1998. The major international companies participating in exploration and development of mineral resources in Uzbekistan included Newmont Mining Corporation of the United States; Mitsui Corporation of Japan; Cameco Corporation, Teck Corporation, RUX Resources Inc., and the Mazarin Mining Corporation of Canada; and Rio Tinto plc and Oxus Mining Limited of the United Kingdom (Nizamov, 1998).

Production of several important mineral commodities produced in Uzbekistan is presented in table 1. These data were provided primarily by the Interstate Statistical Committee of the Commonwealth of Independent States (CIS).

The latest mineral trade data available for Uzbekistan lists total exports of selected minerals in 1997 as follows: secondary aluminum, 1,300 t; copper, 66,727 t; and zinc, 2,500 t (Interfax News Agency, 1998f).

Although not a producer of primary aluminum, Uzbekistan collected and processed scrap through Uzvtorchermet, the country's secondary metals processing concern. Uzbekistan reported shipping 1,100 t of aluminum to the Russian Federation from January through November 1996 (Interfax News Agency, 1997e). Reportedly, the construction of a kaolin-fed alumina refinery was put in abeyance owing to a lack of interest by foreign investors. The original feasibility study for the refinery was carried out by the Russian Aluminum and Magnesium Institute (VAMI) of St. Petersburg and financed by Matabex of Switzerland. The proposed 200,000-metric-ton-per-year (t/yr) alumina plant was to have been built in Akhangaran to take advantage of the annual output of about 6 Mt of kaolin extracted with coal at the Angren open-pit coal mine. Only about one-tenth of the kaolin produced in association with coal mining has been put to commercial use; the rest has been stored in dumps (Interfax

News Agency, 1997k).

In 1997, the Almalyk Mining and Metallurgical Complex was Uzbekistan's major base metals producer. Almalyk mined copper-molybdenum ores. In 1997, mining of lead-zinc ores was sharply curtailed. It had a copper smelter and refinery and a zinc refinery and produced refined copper, molybdenum, and zinc concentrates, as well as a number of byproduct metals, including bismuth, gold, and silver. At Almalyk, copper-molybdenum ores were mined from two open pits, the Kalmakyr and the Sary-Cheku. At these mines, the copper ores reportedly grade between 0.4% and 0.5% copper, and the molybdenum ores, between 0.004% and 0.005% molybdenum. Almalyk was interested in developing new higher grade deposits and acquiring processing technologies to extract minerals from lower grade ores.

Founded in 1949, Almalyk began mining copper-molybdenum ore in the early 1950's at the Kalmakyr deposit. During the enterprise's first 45 years of operation, about 15% of its known copper reserves and 17% of the associated gold reserves had been extracted (Ramazanov, 1984, p. 100-101; Nizamov, 1998).

In 1997, the Government was engaged in preparations to offer 40% of Almalyk's stock for sale to foreign investors through tenders. Daewoo Corporation of the Republic of Korea, Gerald Metals Inc. of the United States, Glencore International of Switzerland, and a consortium consisting of Thyssen Handelsunion and Siemens of Germany and Svedala of Sweden expressed interest in the sale. About one-half of the proceeds from the sale of stock reportedly would be allocated for retooling and modernization of the complex between 1997 and 2007. The modernization program, according to industry experts, would result in an increase of 50% to 70% in the output of copper and precious metals in 2007 compared with that of 1997. Plans called for upgrading smelting and refining technology for improving environmental protection (Interfax News Agency, 1997k).

Almalyk's mining operations provided about 70% of Almalyk's metallurgical copper feedstock requirements. The balance was imported as concentrates from Mongolia and Russia (Interfax News Agency, 1997j). About 23,000 t of copper metal was produced from concentrates imported from Mongolia from January to October 1997 (Interfax News Agency, 1997a). Almalyk was also Uzbekistan's sole producer of silver and second largest producer of gold (after Muruntau), accounting for about 12% to 20% of the country's total output of gold (Interfax News Agency, 1997f).

Most of Almalyk's production was exported. Exports in 1993 were valued at $11.9 million, rising to $96 million in 1995 and $137 million in 1996. In 1997, Almalyk's export target amounted to about $160 million. Despite the enterprise's improving production and export results, a reported continuing shortfall of working capital prevented the planned overhauls of capital equipment ($40 million spent as opposed to $100 million planned for the 10-month period from January to October, 1997). Similarly, a shortfall ($10 million instead of $30 million) was reported for purchases of new equipment during the same period (Interfax News Agency, 1997q).

An agreement was signed during the year between the Aurum Minerals Co. of Canada and Uzbekistan's Ugol coal mining enterprise to extract germanium from the Angren coal deposit. Angren's annual output of coal exceeded 3 Mt, 200,000 t of which reportedly had an average germanium content of about 30 grams of germanium per metric ton of coal. A feasibility study undertaken by Aurum assessed the development of a hydrometallurgical method of extracting germanium from coal, which will involve the separation of germanium from crushed coal (Aurum Minerals Co., 1998, Germanium extraction from coal program—Uzbekistan: Aurum Minerals, accessed August 12, 1998, at URL http://www.totalnet/~bogdan/germanium.html). Uzbekistan's explored resources of gold were estimated to be about 5,300 t. The main reserves of gold, amounting to about 3,200 t, are in the Central Kyzylkum region. The Muruntau gold deposit, the largest deposit of gold in Eurasia and considered to be among the largest deposits of gold in the world, produced 1,186 t of gold between 1967 and 1996. As of January 1, 1996, reserves of gold at Muruntau were reported to be 2,230 t. Undiscovered resources to a depth of 1,500 meters (m) could add another 1,800 t of gold. Muruntau's milling operation annually processes more than 22 Mt of ore (U.S. Trade and Development Agency and the State Committee of Geology and Mineral Resources of the Republic of Uzbekistan, 1996, p. 23).

According to the State Committee for Geology and Natural Resources, seven gold deposits were under development in 1997. by 2005, Uzbekistan envisaged that gold production may be as high as 126 t (Interfax New Agency, 1997h). Foreign investment in Uzbekistan's gold mining and processing sector again played a prominent role in 1997. The leading foreign investor was Newmont, which had a 50% interest in the Zarafshan joint venture (JV) and an Uzbek Government conglomerate (50%) consisting of the State Committee of Geology and Natural Resources and the Navoi mining and beneficiation complex. The Zarafshan JV processed gold bearing tailings from the Muruntau gold mining operation. Muruntau tailings were estimated to contain more than 160 t of gold (Interfax News Agency, 1997c).

Located about 460 kilometers (km) west of Tashkent in the Kyzylkum Desert, the Zarafshan operation consisted of a four-stage crushing plant and heap-leach-processing system working in conjunction with a Merill-Crowe gold recovery plant. During 1996, gold production at the Zarafshan-Newmont operation amounted to 10.154 t and was expected to reach 12 t in 1997 (Interfax News Agency, 1997c; Newmont Mining Corporation, 1998).

In early 1997, the Government of Uzbekistan and William Resources of Canada signed an agreement to form an equal partnership JV for exploration and development of the Kairagach gold and the Aktepe silver deposits. The operating principals in the new joint venture, Uz-Can Mining, were RUX, a subsidiary of William Resources and of Uzbekistan, the State Committee for Geology and Natural Resources, and Tashkentgeologiya (Interfax News Agency, 1997c).

Also in early 1997, Mazarin Mining and Rio Tinto of the United Kingdom bid on tenders to explore and develop seven areas believed to contain gold and nonferrous metals offered in 1996. One of the more-explored regions includes the 260-square-kilometer (km^2) Tamdybulak region, about 25 km north of Muruntau. Gold, silver, and tungsten trioxide resources at Tamdybulak were estimated to be 350 t, 200 t, and 50,000 t, respectively. Exploration work was expected to take 3 to 6 years (Interfax News Agency, 1997c).

The Zoloto Pustyni JV [Teck (49% equity, through its subsidiary, Central Asia Gold Corporation) and the State Committee for Geology and Natural Resources and Kyzyltepageologiya of Uzbekistan (51%)] was established in September 1996 to explore for gold, silver, and nonferrous metals in the Kuldzhuktau mountains in the southwestern part of the Kyzylkum desert. Provisions in the regulations granted Zoloto Pustyni exclusive rights to conduct geologic work within the designated 1,000-km^2 territory and to mine deposits discovered in the region for up to 30 years. Two lode occurrences in the area of study reportedly had been identified with a possible gold content of 10 t (Interfax News Agency, 1997m).

In August, Lonrho PLC of the United Kingdom reportedly decided to discontinue financing operations for the Amantaytau Goldfields JV, in which it owned a 35% interest. Lonhro's decision was based mainly on rising capital and production costs. Other Western investors in the project included the International Finance Corp. with 8% of the assets. The joint-venture project intended to develop and mine the Amantaytau and the Daugistau deposits in the central Kyzylkum area; both are believed to host up to 279 t of gold. The first stage of the mining operation was to be commissioned in 1998. Reportedly, Lonrho and the State Committee for Geology and Natural Resources arrived at an agreement to seek a new partner to purchase Lonrho's 35% stake in Amantaytau Goldfields (Interfax News Agency, 1997b).

In late 1997, Cameco reportedly indicated strong interest in acquiring Lonrho's entire stake in the Amantaytau JV. Cameco had been involved in the Central Asian region in the development of the Kumtor gold deposit in Kyrgyzstan (Interfax News Agency, 1997i).

Also, in late 1997, WMC Ltd. of Australia, which won a tender in 1996 to develop the Gudzhumsay and the Zarmitan gold deposits with Uzbek authorities, indicated 2000 as the target date for the start of gold production at the Zarmitan deposit. WMC and the Government of Uzbekistan, however, were still involved in negotiation on the terms of a proposed joint venture to exploit the deposits commercially. Total resources at the two deposits reportedly amount to 21 Mt of ore, grading 10 g/t gold. The mine-development project involved the modernization of the Mardzhubulak gold recovery plant and the expansion of capacity of operating mines in the area, with output from the project projected to be from 13 to 15 t/yr of gold (Interfax News Agency, 1997q).

In 1997, the Government of Uzbekistan planned the sale of stock in the Bekabad metallurgical plant [also referred to as "Uzbekmetzavod" (the Uzbek metallurgical plant)], the country's only steelmaking plant comprising two 100-t electric arc furnaces with a combined rated capacity of 750,000 t/yr and three 100-t open-hearth furnaces with a combined rated capacity of 320,000 t/yr; the mill also possessed continuous casting machines and rolling mills. In early 1998, the Government announced plans to offer 44% of the shares of Bekabad stock to bidders, including foreign investors. In 1997, Bekabad produced 381,000 t crude steel, which was 13.8% less than that produced in 1996. Rolled steel production also declined by 7%, to 362,000 t. The plant was founded in 1943 mainly to process scrap from the Central Asian republics of the FSU. Raw material shortages began to emerge following the dissolution of the Soviet Union in 1992. In recent years, a shortage of scrap feedstock has resulted in capacity utilization of only 25% to 30% (Interfax News Agency, 1998d). According to spokespersons from the Uzbek State Committee for Geology, the recently discovered iron ore deposits at Syuren-Ata and Temirkan may play a vital role in the steel plant's future operations. The Temirkan deposit contains an estimated 54 Mt of iron, with the ore grading about 32% Fe. The Syuren-Ata deposit has not been fully explored, but the Uzbek State Committee for Geology estimated its reserves to be 24.7 Mt of iron, with the ore grading 37.7% Fe. Additional resources at this deposit were estimated to be 58.2 Mt of iron, with the ore grading 32% Fe. The Syuren-Ata deposit was suitable for open-pit exploitation; the Temirkan deposit, however, could be mined only by underground methods. Mine-development decisions would be made subsequent to the completion of exploration and evaluation work at the Syuren-Ata deposit (Interfax, News Agency, 1998a).

At Almalyk, lead-zinc ores had been mined from three underground mines—the large Altyn Topkan with a capacity of more than 1.5 Mt/yr, the Uch Kulach Mine with a capacity of about 1 Mt/yr, and the Uch Pay mine with a capacity of about 100,000 t/yr. At these mines, the lead-zinc ores reportedly grade from 1% to 2% for lead and 1% zinc. Lead-zinc mining in Uzbekistan was sharply curtailed during 1997, and the country relied mainly on imported concentrates to produce metallic zinc. In 1997, Almalyk was estimated to have produced 50,000 t of metallic zinc.

The country hoped to increase lead-zinc mining by developing new mines. Polymetallic deposits containing lead, zinc, copper, and associated silver, gold, cadmium, selenium, and indium were found at Khandiza. In 1997, Oxus conducted a feasibility study focusing on the development of the Khandiza deposit. The completed feasibility study was to be submitted to the State Committee of Geology and Mineral Resources by December 1997. An initial agreement was signed between Oxus and the Government of Uzbekistan in December 1996 to conduct this work. The Khandiza lead-zinc deposit, in the Sukhandarya region, was reported to have reserves of about 22 Mt of ore containing 700,000 t Pb, 1.54 Mt Zn, 180,000 t Cu, and 2,300 t Ag. Additionally, there were reportedly commercially significant amounts of associated cadmium, gold, indium, and selenium. As part of its exploration and project feasibility work, Oxus conducted independent drill core analysis to validate Uzbek geologic data. Development of the Khandiza deposit through a possible joint venture between Oxus and Uzbekistan's commercial entities would be contingent upon the outcome of the study (Interfax News Agency, 1997d; Nizamov, 1998, p. 15).

Resources of lithium were identified at the Shavazsai lithium deposit in the southern slopes of the Chatkal mountain range, in the Tashkent region. According the State Committee for Geology and Mineral Resources, the Shavazsai deposit hosts reserves of about 31 Mt of ore containing about 165,500 t of lithium oxide. Recoverable byproducts include about 10,000 t of rubidium oxide and about 7,000 t of cesium oxide contained in the ore (U. S.. Trade and Development Agency and the State Committee of Geology and Mineral Resources of the Republic of Uzbekistan, 1996, p. 123). Specialists from the State Committee for Geology indicated that recoveries ranging between 67% and 78% could be achieved. Development of the deposit would be by open-pit mining. Potassium and sodium sulfate also could be produced as byproducts, and part of the tailings could be used in cement production at the nearby cement plant. In 1997, the Government reportedly began the search for foreign investment capital to develop the deposit (Interfax News Agency, 1998b; Nizamov, 1998, p. 22).

Molybdenum concentrates produced by the Almalyk mining and beneficiation complex are shipped to the Uzbek Refractory and High-Temperature Metals Plant (Uzbek Refractory) in Chirchik. These shipments have been able to satisfy only 30% of the plant's feedstock requirements; consequently the plant was operating at only 50% of capacity (Interfax News Agency, 1997n). Molybdenum concentrates were imported mainly from Russian mines in the Orenburg region of the Urals and also from Mongolia and the Primorye region in the Russian Far East. In 1997, Spetsplav, the parent organization of the Refractory and High-Temperature Metals Plant, began to explore the possibility of importing molybdenum concentrate from Armenia as a direct purchase or on a tolling basis.

In addition, Spetsplav controlled more than 10 enterprises, including the Ingichka tungsten mine in the Samarkand region and the Koytash tungsten mine in the Dzhizak region, with design capacities of 500,000 t/yr and 165,000 t/y of ore, respectively (Interfax News Agency, 1998k, p. 6). Enterprise sources indicated continuous declines of tungsten ore grades at both mines. Spetsplav planned to discontinue tungsten mining at the Koytash mine and convert it into a wollastonite mining operation. Despite problems in the country's tungsten industry, Uzbekistan reportedly claimed to possess the world's third largest reserves of tungsten. The main undeveloped deposits are in the central Kyzylkum mountains, including the Sarytau and the Sautbai deposits, which were under exploration in 1997 by the State Committee for Geology and Natural Resources and Mindeco, a subsidiary of Japan's Mitsui Corporation (Interfax News Agency, 1997o).

The Taskazgan graphite deposit, about 230 km northwest of the Bukhara railway station in the Beltau mountains, also contains cobalt, copper, gold, nickel, and platinum-group metals, as well as significant quantities of wollastonite and zeolite. This deposit was discovered in 1928 and sporadically explored from 1931 to 1961. Graphite reserves suitable for development according to the Soviet reserve classification system (balansovye reservy) were reportedly 6.135 Mt of ore containing 1.115 Mt of graphite, 500 t of cobalt, 3,000 t of copper, and 10,000 t of nickel. In the deposit are 6 major explored graphite-bearing ore bodies in graphitized gabbros and about 100 smaller ore bodies in the contacts of gabbro and Paleozoic carbonate rocks. The ore bodies vary from 0.5 to 51.0 m thick, with an average thickness for the entire deposit of 10.5 m. Before 1988, the deposit was operated by the Bukhara graphite-gypsum enterprise. In the beginning of 1989, operation ceased owing to a loss of customers. Some graphite, about 60 t/yr, was mined for local metallurgical use from the rich part of the deposit (Arum Minerals Co. 1998, Taskazgan graphite—Gold deposit, accessed August 12, 1998, at URL http://ww.total.net/~bogdan/ graphite.html; U.S. Trade and Development Agency and the State Committee of Geology and Mineral Resources of the Republic of Uzbekistan, 1996, p. 130).

Wollastonite reportedly is contained in commercially significant quantaties in the Koytash tungsten deposit. Plans called for phasing out the Koytash underground tungsten mining operation and converting it to an open pit wollastonite mine. Spetsplav expected the conversion process to last about 2 years. When fully operational, the converted mine would produce about 100,000 t/yr of ore, which should be enough to produce up to 30,000 t/yr of wollastonite concentrate. Commercial resources at the Koytash deposit reportedly amount to about 4.15 Mt of ore, containing 36.3% to 38.7% wollastonite (Interfax News Agency, 1997n).

In 1997, Uzbekistan increased its output of coal by 10% to produce about 3.13 Mt. The coal mining and processing enterprise Ugol, Uzbekistan's sole producer of coal, mined 97% of its coal from the Angren lignite field in the Tashkent region. The enterprise sold about 92% of its production in 1997 to the country's electric power industry. Ugol's exports of coal in 1997 amounted to about 70,000 t, compared with 100,000 t exported in 1996. Ugol also was involved in the development of the Shargun anthracite deposit in the Surkhandarya region, which produced a small amount of coal (74,000 t) in 1996 (Interfax News Agency, 1997g, p. 13).

In 1997, Uzbekistan increased production of natural gas and crude oil. By 1997, the country ceased being a net importer of crude oil, but continued to import some refinery products. According to the Soviet reserve classification system, Uzbekistan's resources of petroleum were estimated to be 4.435 billion metric tons, of which 527 Mt are termed "proven" reserves. Estimated resources of natural gas amount to 5.4 trillion cubic meters, of which 2 trillion cubic meters is proven reserves. Petroleum and natural gas occur in 160 deposits largely in the Bukharo-Khivin and the Fergana regions of the country (Interfax News Agency, 1997l). In 1997, Uzbeneftegaz negotiated with foreign petroleum companies, including Agip of Italy, Mobil Corporation and Unocal Corporation of the United States, and National Oil Corporation of Japan, to develop the country's petroleum and natural gas resources.

Uzbekistan had two operating oil refineries, the Fergana and the Alty-Aryk, with a combined capacity of 8.6 Mt/yr. Mitsui and Toyo Engineering of Japan were involved in renovating Fergana to install desulfurization equipment and to improve the quality and increase the quantity of the diesel fuel and gasoline produced. In mid-1997, Uzbekistan commissioned the first stage of a new petroleum refinery in Bukhara. The refinery was built with assistance from Technip of France and Marubeni Corporation and JGC Corporation of Japan. The refinery would produce 660,000 t/yr of unleaded gas, 1.33 million metric tons per year of diesel fuel, 300,000 t/yr of aviation fuel, and 12,000 t/yr of sulfur (Interfax New Agency, 1997j).

Also in midyear, Gazprom of the Russian Federation reportedly began considering joining an existing joint venture between Enron Corporation of the United States and Uzbekneftegaz. The existing agreement called for joint gas drilling and export of natural gas through the Russia Ukrainian pipeline network. Gazprom earlier had agreed to allow transit of Uzbek gas, but was considering entry into a joint venture in lieu of collecting transit fees. About 3 billion cubic meters per year of natural gas would be shipped during the first stage and about 5 billion cubic meters per year was to be shipped in the final stage of development

(Interfax News Agency, 1997j).

The Navoi Mining and Metallurgical Complex of Uzbekistan had been among the Soviet Union's major producers of gold and uranium. According to the International Atomic Energy Agency, Uzbekistan is believed to possess the world's seventh largest reserves of uranium. In 1997, Navoi produced about 2,000 t of uranium compared with 1,700 t in 1996. The production target for 1998 was set for about 3,000 t (Interfax News Agency, 1997p).

Lacking a domestic nuclear power industry, during the Soviet period, Navoi exported its uranium production to the Russian Federation for disposition. Since 1992, after the dissolution of the Soviet Union, all the country's uranium production was exported via the Nukem Corp. of the United States. Uzbekistan's resources of uranium were concentrated in 27 deposits, collectively containing a resource of about 55,000 t of uranium (Interfax News Agency, 1997p).

A long-term program of facility modernization and expansion, was begun in 1997; completion was envisaged by 2030. In 1997, Navoi operated three uranium mining divisions. In situ leaching was the chief mining method, where drilling and bore-hole operations composed the main operational activities at the mines. In late 1996, Navoi commissioned a new 2,000-t/y PVC pipe plant. The equipment for the plant was supplied by Mannesman Demag A.G and Klau Massei of Germany. The plant will produce pipe in quantities sufficient to meet all Navoi's annual needs for bore-hole casings; previously, Navoi purchased its casing from the Russian Federation. Industry sources estimated that the new pipe plant will allow a reduction of mining costs by 30% (Interfax News Agency, 1997p). In January 1997, Navoi commissioned a plant to produce submersible pumps; the 1,000-unit-per-year plant also would meet all needs for this equipment. With respect to drilling equipment, Navoi concluded an agreement with the Kungur Drilling Equipment Enterprise in the Perm Region of the Russian Federation. Kungur agreed to deliver drilling units, modified to meet the company's technical requirements, to Navoi by the first half of 1997. In 1997, active negotiations to form a joint mining venture with Nukem were suspended, although Nukem remained the principal exporter of Uzbek uranium to the western market. In 1997, joint uranium mining ventures in Uzbekistan with Cogema of France and the Ministry of Atomic Energy of the Russian Federation were under consideration (Interfax News Agency, 1997p). In 1997, Navoi began to develop the Kendyuk-Tyube uranium deposit. It also expected to begin mining operations at the Levlekan deposit by mid-1998. Industry experts expected a production increase of 300 to 400 t/yr of uranium metal from these mines. The company planned to increase production by 15% to 20% in 1998 compared with that of 1997 (Interfax News Agency, 1998c).

Given Uzbekistan's large gold production, as well as its self-sufficiency in mineral fuels, the mineral sector was and will remain one of the chief contributors to the country's economic development. The country was initially successful in attracting foreign investment to its gold mining sector. Its other mineral sectors, however, were also in need of investment. Their future will depend on assessing whether these other mineral industries can produce profitably for domestic and/or foreign markets and the degree to which Uzbekistan can finance their development either through domestic or foreign investment.

Having been the first country in the FSU to have attracted large-scale foreign investment into its nonfuel mineral sector for gold production, Uzbekistan enjoyed, for a time, a reputation of having provided a business climate amenable to large-scale mineral industry investment. Despite Uzbekistan's initial success in attracting foreign investment in mineral development, however, the country still has not undergone a number of aspects of economic reform that would facilitate investment in the mineral industry, including aspects of tax reform and allowing investors full convertibility of the Soum into foreign currency. It appears that investment would proceed more rapidly if necessary legal and financial frameworks were established to permit enterprises to operate more in accordance with market practices.

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TABLE 1
UZBEKISTAN: PRODUCTION OF MINERAL COMMODITIES

(Metric tons unless otherwise specified)

Commodity		1993	1994	1995	1996	1997 e/
METALS						
Aluminum, secondary e/		3,000	2,000	2,500	2,500	2,700 1/
Copper: e/						
Mine output, Cu content		80,000	50,000	40,000	65,000 e/	73,000
Metal:						
Blister		83,000 r/	70,000	75,000	80,000	85,000
Refined		90,000 r/	90,000	95,000	100,000	115,696 1/
Gold e/		65 r/	65	65	72	82
Lead, mine output Pb content e/		20,000	15,000	10,000	7,500	500
Molybdenum, mine output, Mo content e/		500 r/	500	400	500	500
Silver e/	kilograms	65,000	65,000	70,000	70,000	75,000 1/
Steel:						
Crude		573,000	364,000	352,000	444,000	371,400 1/
Rolled		580,000	340,000	320,000	390,000	350,000
Tungsten, mine output, W content e/		300 r/	300	300	300	250
Uranium, mine output, U content e/		2,500 e/	2,000 e/	2,000	1,700	1,955 1/
Zinc: e/						
Mine output, Zn content		35,000 r/	30,000	15,000	12,000	1,000
Metal, smelter		50,000	70,000	70,000	40,000	50,000
INDUSTRIAL MINERALS						
Cement		5,300,000	4,800,000	3,400,000	3,300,000	3,300,000
Feldspar e/		80,000	70,000	70,000	70,000	70,000
Fluorspar e/		100,000	90,000	90,000	90,000	90,000
Graphite e/		60	60	60	60	60
Kaolin e/		5,500,000 r/	5,500,000	5,500,000	5,500,000	5,500,000
Mineral fertilizers		1,300,000	800,000	900,000	1,000,000	954,500 1/
Nitrogen, content of ammonia e/		900,000	800,000	900,000	950,000	950,000
MINERAL FUELS						
Coal		4,700,000 r/	3,800,000	3,100,000	2,844,000	3,130,000 1/
Natural gas	billion cubic meters	45.0	47.2	48.6	49.0	51.2 1/
Petroleum and gas condensate		3,900,000	5,500,000	7,600,000	7,624,000	7,891,000 1/

e/ Estimated r/ Revised.

1/ Reported figure.

TABLE 2
UZBEKISTAN: STRUCTURE OF THE MINERAL INDUSTRY IN 1997

(Metric tons unless otherwise specified)

Commodity	Major depositsd/ facilities	Location 1/	Annual capacity e/
Coal	Central Asian Coal Association (mining)		
	Angren brown coal deposit	Angren region	6,000,000.
	Baysunskoye deposit	Surkhondaryo region	1,000,000.
Copper:			
Mine output, Cu content	Almalyk mining and metallurgical complex mining Kalmakyr and Sarycheku deposits	Toshkent Wiloyati (Tashkent oblast)	100,000.
Metal	Almalyk refinery	Olmaliq (Almalyk)	130,000
Feldspar	Karichasayskoye and other deposits	Deposits in Samarqand (Samarkand) and Toshkent (Tashkent) regions and Karakalpakstan (Karakalpakskaya ASSR)	120,000.
Fertilizers	Kokand superphosphate plant	Quqon (Kokand)	NA.
	Samarkand chemicals plant	Samarqand	NA.
	Ammophos production association		NA.
Fluorspar	Agata-Chibargata, Aurakhmat, Kengutan, Kyzylbaur, Naugarzan, and Nugisken deposits	East of Toshkent (Tashkent)	150,000.
Gold	Muruntau deposit	Nawoiy (Navoi) region	85.
Kaolin	Angren deposit	Angren region	8,000,000.
Lead-zinc:			
Mine output, metal content	Almalyk mining and metallurgical complex mining Uchkulach deposit	Toshkent Wiloyati (Tashkent oblast)	40,000 (lead) 80,000 (zinc).
Zinc, metal	Almalyk refinery	Olmaliq (Almalyk)	120,000.
Molybdenum: Mine output , Mo content	Almalyk mining and metallurgical complex mining Kalmakyr, Sarycheku deposits	Toshkent Wiloyati (Tashkent oblast)	900.
Metal	Uzbek refractory and hard metals plant	Chirchiq (Chirchik)	NA.
Natural gas liquids	Mubarek gas-processing plant	Muborak (Mubarek)	1,200,000.
Petroleum and natural gas	More than 40 oil and gas deposits and more than 15 gas deposits under exploitation	Oil and gas deposits are concentrated in the Bukhoro-Khiwa (Bukhara-Khiva) and Sukhondaryo regions and the Farghona (Fergana) valley	5,000,000. (petroleum).
Do.	Major gas deposits: Dzharkakskoye, Gazlinskoye, Mubarekskoye, and Shurtanskoye	See above.	50 billion cubic meters (natural gas)
Do.	Major oil deposits: Khaudagskoye, Uchkyzylskoye, Plautomslpue, Palvantashskoye Yashi, Alamyshikskoye, Sharikhan-Khodzhiabadskoye	See above.	5,000,000 (petroleum).
Petroleum, refined	Fergana oil refinery	Farghona region	NA.
Do.	Bukhara oil refinery	Bukhoro	NA.
Steel, crude	Bekabad steel mill	Bekabad	1,100,000.
Tungsten:			
Mine output, W content	Koytash deposit	Northeastern Uzbekistan	1,200.
	Ingichka deposit	Zirabulakskie Mountains	
	Ugat deposit	northern Uzbekistan	
Metal	Uzbek refractory and hard metals plant	Chirchiq (Chirchik)	NA.
Sulfur	Mubarek gas-processing plant complex	Mubarek	2,000,000.
Uranium	Navoi mining and metallurgical complex	Nawoiy (Navoi) region	NA.

e/ Estimated. NA Not available.

1/ New names and spellings for locations will be used whenever available; old names will appear in parentheses.

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